JURASSIC BIVALVIA AND GASTROPODA FROM TANGANYIKA AND KENYA

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JURASSIC BIVALVIA AND GASTROPODA FROM TANGANYIKA AND KENYA

By L. R. COX

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SYNOPSIS

Jurassic Bivalvia and Gastropoda from Tanganyika and Kenya in the collections of the British Museum (Natural History) are described in this memoir. The bulk of the material has come from three sources, the British Museum East Africa Expeditions (1924–31), the Geological Survey Departments of the two territories concerned, and the B.P.–Shell Petroleum Development Company of Tanganyika, Ltd. 207 species of Bivalvia and 56 of Gastropoda are described, but among them are 10 identified only generically and 12 of which the specific identifications have been qualified or queried. The totals include 84 new species of Bivalvia and 33 of Gastropoda, while one bivalve species has been re-named on account of homonymy. One new subgenus of Bivalvia, *Africomiodon* (subgenus of *Eomiodon*), and one new genus of Gastropoda, *Africoconulus*, are erected.

The strata which have yielded the specimens described range from Toarcian to uppermost Jurassic in age. The occurrence of many species found also in the European Jurassic confirms evidence from other parts of the world of the very wide geographical distribution of such forms. These widespread species are particularly abundant in the Callovian and Oxfordian material. At the same time, the existence of a subprovince which included countries surrounding the western part of the Indian Ocean (Madagascar, Arabia, India and Pakistan, as well as East Africa) is indicated by the occurrence of a number of well-characterized species found in one or more of the other countries mentioned, but not in Europe. Ignoring the qualifications ("cf." and "aff.") of a few identifications, these results are summarized in the following table:

Geological Stage	*Species here recorded*	*New species*	*Species known only from E. Africa*	*Species found in Europe*	*Species found in India etc. but not Europe*
Kimmeridgian . .	92	35	56	32	3
Oxfordian . . .	53	16	21	27	5
Callovian . . .	46	5	8	32	6
Bathonian* . .	10	4	4	4	2
Bajocian† . . .	44	29	27	12	4
Toarcian . . .	30	22	22	7	1

*Including Asaharbito Beds.
†Including Pindiro Shales.

I INTRODUCTION

During the past 40 years numerous fossil invertebrates from the Jurassic rocks of East Africa have been added to the collections of the British Museum (Natural History). This material has come from several sources. From 1924 to early in 1931 the Museum sent a series of expeditions to collect from the dinosaur beds of Tendaguru, Tanganyika, under the leadership of W. E. Cutler, J. Parkinson and F. W. H. Migeod in succession, and the material brought back to England included many invertebrate specimens as well as dinosaur bones. From about the same period to the present day the Geological Survey Departments of Tanganyika and Kenya have from time to time sent collections of fossils to London for identification, and the material from these sources which has been deposited in the Museum during the past few years has been particularly extensive. From 1951 to 1959 the B.P.–Shell Petroleum Development Company of Tanganyika Ltd. investigated a considerable area of the coastal region of the two territories and a selection from the Jurassic specimens collected has been generously presented to the Museum. Small collections from East Africa have also been acquired by the Museum from other sources. Preliminary reports on some of the Geological Survey material have appeared in the publications of these institutions, and in a few cases these have included illustrations of some of the fossils. Otherwise, the only publications dealing with Jurassic bivalves and gastropods from this region now in the Museum consist of two short notes by the present writer (Cox, 1937*a*, 1937*b*). It has, therefore, now seemed appropriate to describe in a single memoir all the East African Jurassic material belonging to these classes which is now available in London.

This account has been written at a time when there are movements afoot to stabilize Jurassic stratigraphical nomenclature by international agreement. It seems probable that the decision may be reached to restrict the range of the Kimmeridgian stage in accordance with non-British usage, and possible that the term Portlandian may be abandoned. It is, however, uncertain what stage name (Volgian or Tithonian) will be accepted for Jurassic beds of later date than the restricted Kimmeridgian. In East Africa ammonite evidence establishes the age of the pre-Cretaceous marine beds at Tendaguru as Upper Kimmeridgian in the British sense (Arkell 1956 : 355), and there is no palaeontological evidence for correlating any deposits with the type Portlandian or with post-Kimmeridgian (*sensu anglico*) horizons of the European Tithonian. It has therefore been decided to use the term Kimmeridgian in the British sense in the present memoir, to dispense with the terms Portlandian and Tithonian, and merely to allude to very late Jurassic beds, the exact age of which is unestablished, as " uppermost Jurassic ".

The writer expresses his great indebtedness to all who have placed specimens and information at his disposal, particularly successive Directors and members of the staffs of the Tanganyika and Kenya Geological Surveys, and Dr. F. E. Eames and his colleagues of the palaeontological staff of the British Petroleum Company, Ltd. Mr. D. L. F. Sealy, of the Department of Palaeontology of the British Museum (Natural History), has drawn the two sketch-maps appearing as text-figures, and

Mr. C. P. Palmer, of the same Department, has rendered invaluable assistance with the preparation of many of the fossil illustrations.

II HISTORY OF INVESTIGATION OF JURASSIC MOLLUSCA OF EAST AFRICA

Knowledge of the Jurassic stratigraphy and palaeontology of East Africa has been reviewed at rather frequent intervals as it has progressed during the past hundred years. Successive works which may be particularly mentioned in this connection are those of Neumayr (1885), Dacqué & Krenkel (1909), Behrend (1918), Krenkel (1925), Arkell (1956), Aitken (*in* Quennell *et al.*, 1956 ; also *in* Quennell *et al.*, 1957), and Pulfrey (1963). In view of the existence of these works, particularly the later ones, it is necessary for the purposes of the present memoir to do little more than summarize the history of the study of the Jurassic bivalves and gastropods of the region, although a few passing references may be made to work on the ammonites.

The earliest record of the occurrence of marine Jurassic rocks in East Africa was a short note by Fraas (1859) recording the discovery by a missionary, J. L. Krapf, of an ammonite at Kisaludini, near Mombasa. This specimen, originally identified as *Ammonites annularis* Reinecke, was subsequently described as *Perisphinctes* (*Virgatosphinctes*) *krapfi* by Dacqué (1910 : 13, pl. 3, fig. 3), who showed that its age was Upper Oxfordian and not Upper Dogger (Callovian), as supposed by Fraas.

Beyrich (1877, 1878) published two short papers on ammonites which the explorer J. M. Hildebrandt had sent to him from localities near Mombasa, his conclusion being that various stages of the Jurassic are represented in the district. In the account of his journey Hildebrandt (1879 : 254, 272) mentioned the occurrences of Jurassic beds in the district. Further south, in Usambara, the northern coastal district of Tanganyika, fossiliferous rocks now known to belong to the Jurassic were recorded by the English traveller J. Thomson (1879, 1881), but he thought that their fossils suggested a Carboniferous age. Farler (1879 : 87) referred to the occurrence of a fossiliferous pisolitic limestone in the same area but made no suggestion regarding its age.

Baumann (1891 : 4, 116), in his work on Usambara, definitely recorded the presence of Jurassic rocks in that area but cited none of the included fossils by name, and in the same year Stuhlmann (1891) referred to the outcrop of a narrow belt of Jurassic rocks behind the Tertiary formations near Pangani, further south, mentioning that they contained ammonites. A number of fossils, mostly ammonites, collected by Stuhlmann at the locality Mtaru were described by Tornquist (1893), who assigned an Oxfordian age to them ; no bivalves or gastropods were mentioned. In the same year, Jaekel (1893) published a short note on some Jurassic fossils from Usambara sent to Germany by G. Lieder, by then established as official geologist in what was at that time German East Africa. For the first time reference was made to some Bivalvia, including an oyster said to be scarcely separable from *Ostrea dextrorsum* Quenstedt (a probable synonym of *Lopha solitaria* (J. de C. Sowerby)), a *Lima* and a *Pseudomonotis*?, neither identified specifically. An Upper Jurassic age was assigned to these forms. In the next year Stuhlmann himself (1894*a*, *b*) published two short papers in which he referred to the presence of Jurassic rocks in the hinterland of Dar es Salaam and Bagamoyo, mentioning the occurrence of fossil molluscs in them without citing any specific names.

Futterer (1894) reviewed occurrences of Jurassic rocks in the hinterland of Mombasa, Tanga, Saadani and Dar es Salaam in the light of fossils sent to Germany by Hildebrandt, Lieder and von dem Borne. Although mainly devoted to ammonites, thought to belong to stages ranging from Callovian to Kimmeridgian or possibly Tithonian, this paper may be noted particularly as containing the description of the first supposedly new bivalve species from the East African Jurassic. It was a *Chlamys* described (Futterer 1894 : 91, pl. 5, figs. 4, 4*a*) as *Pecten bipartitus* and came from beds at Mkusi[1], near Tanga, thought to be Oxfordian in age. In the present work it is suggested that the form in question should be regarded as a synonym of the European species *Chlamys subtextoria* (Münster).

The most important contribution to the Mesozoic palaeontology of East Africa that had so far appeared was Müller's (1900) description of the fossils collected by W. Bornhardt. This material came from 23 localities in Tanganyika. The beds at nine of these were assigned to various stages of the Jurassic and those at 14 to the Cretaceous, but it has since been suggested that two of the 14 belonged to the uppermost Jurassic and a third to an earlier stage of that system. Most of the Jurassic localities were situated in the hinterland of Kiswere, in the southern part of the territory, but one lay to the north-west of Kilwa and others in the hinterland of Dar es Salaam and Bagamoyo. The Jurassic bivalves and gastropods described by Müller included a number of forms definitely or tentatively referred to species previously known from Europe, but the following were regarded as new: *Cucullaea lasti*, *Isocardia subtenera*, *Ceromya aequatorialis*, *Avicula lieberti*, *Arca uitenhagensis*, *Trigonia beyschlagi*, *Protocardia schencki*, *Exogyra solea*, *Straparollus suprajurensis*, *Nerinea credneri*. In the present memoir some of these are regarded as synonyms of species which had been described previously, and one or two are recorded from further localities ; five, however, have not been encountered in the material studied.

A note published by Menzel (1902) dealt with Jurassic fossils collected by Dantz in Tanganyika. These included a number of bivalves, some of which were referred to species already known from Europe ; two, however, to which the new names *Pecten muelleri* and *Gervillia dantzi* were assigned, but which are not identifiable from the brief descriptions, were recorded from beds thought to be Bathonian in age at a locality near Kibwendere on the Ngerengere river. Koert (1904) recorded the presence of Callovian beds, identified by their ammonites, near Tanga, but did not list any other mollusca. Fraas (1908*a*) gave an account of his observations on the dinosaur beds at Tendaguru and neighbouring localities in the Lindi hinterland, mentioning the abundance of a trigoniid which he recorded as *Trigonia beyschlagi* Müller, and referring also to a limestone full of nerineids. He considered all the beds to be Cretaceous in age. The same author (1908*b*) also published a short account of observations on Jurassic rocks exposed along the railway lines running inland from Dar es Salaam and from Mombasa respectively. Among the sections

[1] See Aitken, *in* Quennell *et al.*, 1956 : 157.

of beds illustrated was one near Pendambili (now Magindu) station[2], from which an engineer, Kinkelin, had forwarded a series of fossils to Germany. E. Dacqué's determinations of the fossils from this locality, which included a few bivalves, were cited in the paper.

In 1910 Dacqué published a memoir on the Jurassic fossils from Mombasa and from the Pendambili quarry which Fraas, Kinkelin, and others had collected. The Mombasa material consisted only of cephalopods of Upper Jurassic age. The Pendambili fossils, which were evidently Callovian in age, included a number of bivalves, some of which were referred to species already known from Europe. Among them, however, was a new astartid, *Astarte muelleri*, considered to be identical with a form from southern Tanganyika which Müller (1900 : 534, pl. 17, fig. 7) had figured under the name *Astarte* sp. In the same year Krenkel (1910) published an account of invertebrate fossils collected by Fraas from the neighbourhood of Tendaguru. These were still all considered to be Cretaceous in age, but included some forms now known to have come from Upper Jurassic beds. Among the last were the supposedly new species *Avicula tschingira*, *Pinna "g. mülleri"*, *Perna tendagura*, and *Trigonia matapuana*, the last founded on what was probably a young specimen of the "*Trigonia smeei*" group.

The scientific results of the German expeditions (1909–12) to collect from the dinosaur beds of Tendaguru were published in 1914. Dietrich, in his account of the gastropods, described the following new species of Upper Jurassic age : *Rhytidopilus obliquus*, *Physa tendagurensis*, *Patella kindopensis*, *Nerita* (*Lissochilus*) *stremmei*, *Pseudomelania* (*Oonia*) *recki*, and *Nerinea hennigi*. He also recorded the common Tendaguru nerineid under the name *Nerinella credneri* (Müller), the original type-specimens of which had come from beds of Callovian age. At the same time Hennig (1914*b*) described the bivalves of the saurian beds, apart from the trigoniids, which were dealt with in a separate paper by Lange (1914). Hennig recorded a number of species already known from the Jurassic of Europe, but described three supposedly new forms, *Cucullaea irritans*, *Gryphaea bubo*, and *Pseudomonotis tendagurensis*. Lange referred the common trigoniid from the Tendaguru series to the species *Trigonia smeei* J. de C. Sowerby, originally described from India, placing *T. beyschlagi* Müller in its synonymy, and a second Jurassic species was described by him under the new name *T. dietrichi*.

In a subsequent paper Hennig (1917) referred to a small series of molluscs which he had obtained from black calcareous concretions occurring in a shale formation (the Pindiro Shales) along the Pindiro valley, north-west of Lindi, in southern Tanganyika. The specimens collected, which were not figured, were recorded as *Gervillia* aff. *iraonensis* Newton, *Cypricardia* aff. *nuculiformis* (Roemer), *Neaera* sp., "*Alaria*, Gruppe der *Al. hamus*", and "? *Cryptaulax*, Gruppe der *armata* Goldf. sp." The age of this assemblage was thought to be most probably "Upper Dogger". It is probable that most of the forms recorded belonged to species found in the shales themselves and described under other names in the present memoir.

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[2] See Aitken, *in* Quennell *et al.*, 1956 : 178, footnote, for information about the position of the Pendambili quarry, which was about 2 km. east of Magindu station.

In the same year Lange (1917) reverted to the subject of the Tendaguru trigoniid which he had recorded as *Trigonia smeei* J. de C. Sowerby in 1914. He remarked that this species appeared to be a characteristic fossil of the Tithonian, and also noted that there was some similarity between it and a South American form which Jaworski had described as *Trigonia burckhardti*.

Reck (1921) described a small series of molluscs collected along the railway running inland from Dar es Salaam. The specimens came from a section between 139·5 and 139·75 km. from that town (according to the former alignment of the railway, since changed), that is, a little to the west of Kidugallo station. In addition to several forms identified only generically, the species recorded included a representative of a new genus of Arcticidae (*Dietrichia parvula* gen. et sp. nov.) and a small gastropod described as *Neritodomus subkidugallensis* sp. nov. The fossil evidence was not clear enough to enable an exact date to be assigned to this bed, but Reck considered that not only was it the lowest fossiliferous horizon exposed locally, but also that it was the lowest horizon with marine Jurassic fossils which up to then had been found anywhere in East Africa. He considered that it might lie close to the boundary of the Upper Lias and Dogger. In 1924 Hennig published a detailed account of the Jurassic beds, ranging from the Lower Dogger to the Lower Malm in German terminology, exposed along and near the same railway, between Kidugallo and Ngerengere. He recorded and in some cases figured a number of bivalve and gastropod species previously known from Europe or elsewhere, and described the following as new: *Modiola menzeli* [Upper Dogger ; not figured], *Ostrea* (*Alectryonia*) *bornhardti* [Upper Dogger], *Isocardia substriata* [Callovian], *Pteroperna africana* [" Lower Malm "], *Corbula pseudomucronata* [Oxfordian], *Anisocardia recki* [Oxfordian].

Dietrich (1925) gave an account of fossils collected in the Mandawa-Mahokondo area of Tanganyika, where the succession of Upper Jurassic beds is entirely marine and uninterrupted by dinosaur-bearing beds as at Tendaguru. His paper dealt mainly with the cephalopods, but the small number of bivalves recorded included a new species, *Gryphaea hennigi*, thought to be Kimmeridgian in age. Gregory (1927) placed on record the discovery near Mombasa of a specimen of the species then known as *Parallelodon egertonianus* (Stoliczka), already discovered in Somaliland and Arabia as well as in the Himalayas, where it occurs typically in the Spiti Shales. Two years later a note by Parsons (1929) recorded the presence of the bivalve *Posidonia* cf. *ornati* Quenstedt in the Miritini Shales (Callovian) of the Mombasa district.

This period was marked by a renewal, on the part of Kitchin (1926, 1929), of the discussion initiated by German workers regarding the age of the dinosaur beds at Tendaguru. Kitchin (1929 : 208), as the result of his work on the Cutch Jurassic bivalves, had concluded erroneously that *Trigonia smeei* occurs in that area in Lower Cretaceous beds, and was therefore loath to accept the conclusion that the " *T. smeei* " beds at Tendaguru belonged to the Upper Jurassic, particularly as certain species (*Trigonia ventricosa* (Krauss), *Seebachia bronni* (Krauss), *Astarte herzogi* (Goldfuss) and *Gervillia dentata* (Krauss)) originally described from the Lower Cretaceous Uitenhage beds of South Africa had been recorded from them. Ammonites which Spath had pronounced to belong to the Middle Kimmeridgian had, it is true, also been found at Tendaguru, but Kitchin suggested that these were derived specimens and maintained that all the beds exposed there belonged to the Lower Cretaceous. This contention evoked rejoinders from Dietrich (1927) and Hennig (1927). It was, however, not long before Spath showed that in India *T. smeei* occurs in Oxfordian and not in Lower Cretaceous beds, and the dispute about the beds at Tendaguru was not continued. Actually, the records of Uitenhage species from the "*T. smeei*" beds appear to have been unreliable.

In the third of a series of monographs, inspired by J. W. Gregory, on collections of fossils from N.E. and E. Africa which had been presented to the Hunterian Museum, Glasgow University, Weir (1930) described a series of molluscs and brachiopods from the Mombasa district, largely collected by Miss M. McKinnon Wood. The formations from which the material described was collected ranged from the Kambe Limestone (Upper Bajocian-Bathonian) to the Changamwe Shale (Upper Oxfordian-Kimmeridgian). Bivalves described included a number of forms assigned either definitely or with qualification to European species and no new species were described.

An important monograph by Dietrich (1933) supplemented the earlier works dealing with ammonites and bivalves collected by the German expeditions to Tendaguru. 91 bivalves (53 from the Upper Jurassic and 38 from the Cretaceous) were recorded in this work, the Jurassic forms including the following new species or varieties: *Lithophaga suboblonga*, *Oxytoma inequivalvis* var. *hennigi*, *Stegoconcha solida* var. *tendagurensis* [previously described by Krenkel as *Pinna g. mülleri*], *Pecten* (*Chlamys*) *curvivarians*, *Alectryonia hennigi*, *Epihippopodium quenstedti*, *Astarte recki*, *Astarte subobovata*, *Astarte krenkeli*, *Astarte weissermeli*, *Seebachia janenschi*, *Corbis* (*Sphaera*) *subcorrugata*, *Cardium* (*Tendagurium*) *propebanneianum*, *Arcomya* (*Pachymya*?) *robustissima*.

A memoir by Hennig (1937) on the sedimentary formations of the Lindi–Kilwa hinterland included a palaeontological section in which, in addition to a number of previously known forms, the following new gastropod and bivalve species were described: *Nummocalcar* (*Platybasis*) *dietrichi* [*Kimmeridgian*, Tunduru], *Clavotrigonia discordans* ["*Trigonia smeei*" bed, Tunduru], *Lima matumbiana* [Dogger, Matumbi]. In the same year the present writer (Cox 1937*a*, *b*) published two papers in which a few bivalves collected by G. M. Stockley, of the Tanganyika Geological Survey, were described. A new subgenus, *Indogrammatodon*, was founded for the reception of the Indian Jurassic species *Cucullaea virgata* J. de C. Sowerby and related forms, and a new species, *Grammatodon* (*Indogrammatodon*) *stockleyi*, was described from beds of Callovian age about 11 miles S.E. of Lugoba, Tanganyika. A new trigoniid species, *Trigonia tealei*, was based on specimens from the same locality, and was also recorded, with several other species, from Callovian beds east of Magindu station on the Tanganyika Central Railway.

A second collection made by Miss M. McKinnon Wood from the coastlands of Kenya included material dealt with by Weir in a further paper (1938). The Kambe

Limestone, now definitely established by ammonites to include both Upper Bajocian and Bathonian horizons, was the source of most of the material in this collection, but there were also specimens from higher horizons of the Jurassic. Weir's paper included descriptions of the following new species: *Nucula woodae* [Kambe Limestone], *Nucula* (*Palaeonucula*) *gregoryi* [Miritini Shales (Callovian)], *Lopha krumbecki* [Oxfordian-Kimmeridgian], *Chlamys* (*Aequipecten*) *spathi* [Kambe Limestone], *Plesiopecten kenyana* [Kambe Limestone], *Lima* (*Pseudolimea*?) *woodae* [Kambe Limestone].

A series of bivalves and gastropods collected mainly from the locality Cud-Finagubi, about 3 miles S. of Mandera, in N.E. Kenya near the frontier with Somalia, formed the subject of a series of notes by Venzo (1942*a*, *b*, 1943, 1944*a*–*c*, 1945), followed by a larger memoir (Venzo 1949). About half the bivalves were identified (some with qualification) with previously described species and it was concluded that the age of the assemblage was Bathonian. Twenty species, a few with numerous named varieties, were described as new. Later field work has led to the conclusion that the beds yielding this assemblage belong to a horizon very high in the Jurassic and that some of Venzo's specific identifications are to be queried. The age of the Cud Finagubi assemblage is discussed later in the present memoir (p. 24).

Several reports of the Kenya Geological Survey published from 1952 onwards have included lists of Jurassic bivalves and gastropods, mainly from N.E. Kenya, based partly on identifications by the present writer, and in two of these (Saggerson & Miller 1957 ; Joubert 1960) some of the specimens have been illustrated photographically. Of publications of the Tanganyika Geological Survey, particular reference must be made to the Bulletin by Aitken (1961) dealing with the Mandawa-Mahokondo area of southern Tanganyika. This work includes a statistical study of African specimens of the trigoniid subgenus *Indotrigonia*, which comprises *Trigonia smeei* J. de C. Sowerby and related species. Aitken concludes that the true *T. smeei*, which, as already mentioned, occurs typically in India in beds of Oxfordian age, has not yet been found in East Africa, and that the common species of the Upper Kimmeridgian beds at Tendaguru is a distinct form to which he assigns the name *Trigonia* (*Indotrigonia*) *africana*. The following other trigoniids are also described in the same paper: *Trigonia* (*Indotrigonia*) *mandawae* sp. nov. [Lower to Upper Kimmeridgian], *T.* (*I.*) *beyschlagi* Müller [" Tithonian "], *T.* (*I.*) *robusta* sp. nov. [" Tithonian "], *T.* (*I.*) *v-striata* sp. nov. [" Tithonian "], *T.* (*Trigonia*) *tanganyicensis* sp. nov. [Middle or Upper Kimmeridgian], *Laevitrigonia curta* sp. nov. [" Tithonian "], *Opisthotrigonia curvata* sp. nov. [" Tithonian "]. In addition, many bivalve species belonging to other families are listed from various horizons.

III EAST AFRICAN JURASSIC BIVALVE AND GASTROPOD FAUNAS AND THEIR CHARACTERISTICS

Liassic Assemblage

The oldest beds anywhere in Kenya or Tanganyika assignable on fossil evidence to the Jurassic system are limestones exposed at Didimtu Hill, 2 miles N.E. of Bur Mayo, in N.E. Kenya. These beds are separated from the ancient rocks of the

Basement System by the Mansa Guda formation (Ayers 1952 : 6 ; Thompson & Dodson 1960 : 15), a series of sandstones and conglomerates, some 1300 feet in thickness, which so far have yielded no fossils. The Mansa Guda formation may be the equivalent of the Lugh Series of Stefanini, consisting of some 400 ft. of sandstones, marls and limestones developed to the east, in Somalia. Stefanini (1932) recorded a small mussel-like bivalve and a naticiform gastropod from these beds and thought that their age might be Lower Liassic. The fossils are not, however, diagnostic and might equally well be of Triassic age. In the coastal area of southern Kenya the Duruma formation, except for part or all of its top division, the Mazeras Sandstones, is probably of much the same age as the Mansa Guda formation. In Tanganyika the Jurassic rocks are underlain by beds of the Karroo System. There is at present no fossil evidence that the Karroo beds extend above the Trias.

The Lower Toarcian Didimtu Beds of N.E. Kenya were discovered by P. E. Kent and F. M. Ayers in 1951 and first recorded by the latter (Ayers 1952 : 9). They have been described in more detail by Thompson & Dodson (1960 : 20), who quote (: 22) a preliminary report on the Bivalvia and Gastropoda by the present writer. These fossils are described in the present work and listed on p. 189. Of the 30 named species now recorded from Didimtu, 22 are described as new and eight (one with the qualification " aff. ") are referred to forms described previously, one of which is re-named. Seven of these are also known from Europe. The eighth, *Weyla ambongoensis*, a representative of the Pectinidae, was originally described from Madagascar and is also found in Pakistan and Morocco. It affords somewhat meagre evidence that a faunal sub-province comprising the western part of the present Indian Ocean region and extending over northern Africa had come into existence. Affinities with the Lias of Morocco are also indicated by the occurrence of the new gastropod genus *Africoconulus*, the type-species of which occurs in the Domerian of that country. The Didimtu fauna includes a rather larger assemblage of Toarcian gastropods and bivalves than the contemporaneous fauna from Madagascar described by Thevenin (1908*b*), which consisted of 18 bivalves and two gastropods.

Bajocian Assemblages

The Upper Bajocian age of beds included in the Kambe Series, developed in the coastal district of Kenya, was established on the basis of ammonites collected by Miss M. McKinnon Wood. The bivalves and gastropods from her collections, amounting to 22 and two species respectively (some, however, identified only generically), were described by Weir (1930, 1938). No specimens from these beds have been examined in the course of the present work. The Kambe Limestone is, however, underlain by the Mazeras Sandstones, yielding fossil wood considered by its most recent students to be Upper Triassic in age (Caswell 1956 : 16), although it was thought that the upper limit of the Sandstones might lie within the Lower Jurassic (Caswell 1953 : 17 ; 1956 : 17 ; Williams 1962 : 10). A sample of hard sandstone belonging to this formation and found at the locality Ribe, about 9 miles N.E. of Mazeras, has yielded a small series of gastropod moulds, one of which is described in the present work as *Cirrus mazerasensis* sp. nov. Unfortunately, this material is insufficient to establish the geological age of the sample, but it is improbable that it is pre-Jurassic in view of the rareness of *Cirrus* in rocks older than the Lias. It is suggested that a Bajocian age may be assigned to the sample until further evidence is forthcoming.

Bajocian deposits occur along the Tanganyika Central Railway between Ngerengere in the west and a point between Kidugallo and Magindu in the east, but it is still uncertain where to draw their upper limit. They also crop out in the area to the north and south. The geology of this district was described by Hennig, who distinguished (1924 : 114, 121) between the Ngerengere Beds, continental deposits belonging to the Karroo System and thought by him to be Liassic in age, and the Ruvu Beds, which he considered to range from the Aalenian to the Oxfordian. No specimens from "Reck's fossil bed" (see p. 8), thought to be the lowest fossiliferous horizon of the local Jurassic series, have been examined in the course of the present work. That the Lower Bajocian (Aalenian) is represented in this area is shown by Arkell's (1956 : 330) record of ammonites of this age in carboniferous shales encountered in boreholes in search of limestone north of Kidugallo. Some bedding planes of these shales are covered with specimens of the bivalve *Bositra buchi* (Roemer) [= *Posidonia ornati* Quenstedt]. The " *Posidonia* " from Kissemo, N. of Kidugallo, recorded by Hennig (1924 : 43), may have come from about the same horizon. The Kidugallo Oolite, a formation overlying " Reck's fossil bed " and also included by Hennig in his Lower Ruvu Beds, yielded a number of Pectinidae and other molluscs recorded by Hennig (1924 : 14–20), but no fossils from this horizon have been seen by the present writer. Some molluscs now described came, however, from two small quarries north of Ngerengere Station, where the horizon is close to the junction of gneiss and sediment and probably fairly low in the local succession of fossiliferous Jurassic rocks. The bivalves include the species *Eomiodon baroni* (Newton) and *Bakevellia iraonensis* (Newton), both originally described from Madagascar, the former from the Bathonian, the latter from Middle Jurassic beds the precise age of which has not hitherto been recorded.

Hennig's Middle Ruvu Beds and the Station Beds of King (1954 : 15) are approximately synonymous. Aitken (*in* Quennell *et al.*, 1956 : 180–181) has compiled a list of their fossils as recorded by Hennig. The majority are probably of Bathonian age, but those from the more easterly localities (Hennig 1924 : 50–55) may be from the Bathonian. Of the molluscs described in the present work, it is most probable that, in addition to those from near Ngerengere, specimens localized as Kidugallo and as 6 miles N.W., 5 miles N.W., 2½ miles N.N.W., 1½ miles N.N.W., and 1¼ miles E. of that place are all of Bajocian age. The full list of Bajocian species definitely identified from this area in the course of the present work is, therefore, as follows :

Modiolus anatinus (Smith)
Bositra buchi (Roemer)
Bakevellia iraonensis (Newton)
Lopha gregarea (J. Sowerby)
Trigonia costata Parkinson

Trigonia kenti sp. nov.
Trigonia kidugalloensis sp. nov.
Lucina despecta Phillips
Fimbria kidugalloensis sp. nov.
Pronoella kidugalloensis sp. nov.
Eotrapezium ? *kenti* sp. nov.
Eomiodon baroni (Newton)
Eomiodon tanganyicensis sp. nov.
Corbula eamesi sp. nov.
Pholadomya lirata (J. Sowerby)
Goniomya trapezicostata (Pusch)
Osteomya dilata (Phillips)
Pseudomelania (*Oonia*) *kidugalloensis* sp. nov.
Coelostylina stockleyi sp. nov.
Ataphrus aff. *acmon* (d'Orbigny)

Beds which are probably Bajocian in age (although ammonite evidence on this point is lacking) are also well developed towards the southern end of the Jurassic outcrop, in the area N.W. of Lindi. They consist largely of shales (the Pindiro Shales of Hennig) but there are also limestone bands and layers of limestone nodules. The shales, yielding numerous small molluscs, were encountered in trial borings for oil near Mandawa. The following list of species described in the present work supplements (or most probably in part replaces) Hennig's records of the species found in these shales, which have been quoted by Aitken (*in* Quennell *et al.*, 1956 : 175) :

Parallelodon pindiroensis sp. nov.
Modiolus imbricatus (J. Sowerby)
Gervillella orientalis (Douvillé)
Pinna buchii Koch & Dunker
Astarte pindiroensis sp. nov.
Astarte kenti sp. nov.
Protocardia bipi sp. nov.
Protocardia besairiei sp. nov.
Mactromya eamesi sp. nov.
Pronoella pindiroensis sp. nov.
Pronoella putealis sp. nov.
Corbula mandawaensis sp. nov.
Corbula pindiroensis sp. nov.
Corbula tanganyicensis sp. nov.
Ceratomya tanganyicensis sp. nov.
Thracia lens (Agassiz)
Coelostylina mandawaensis sp. nov.
Zygopleura mandawaensis sp. nov.
Procerithium (*Rhabdocolpus*) *mandawaense* sp. nov.
Exelissa africana sp. nov.

Pietteia mandawaensis sp. nov.
Pietteia stockleyi sp. nov.
Pictavia tanganyicensis sp. nov.
Ampullospira besairiei sp. nov.

All except four of the species in the above list are new, and not one occurs in rocks regarded as Bajocian in S.E. Kenya or in the Kidugallo district of Tanganyika. Hennig (1917), however, recorded *Gervillia* aff. *iraonensis* Newton from the Pindiro Shales and the species in question, *Bakevellia iraonensis*, is here recorded from Bajocian beds at Ngerengere, west of Kidugallo. The four previously described species in the above list from the Pindiro Shales include *Pinna buchii*, *Thracia lens* and *Modiolus imbricatus*, all of which occur in Europe in both the Bajocian and the Bathonian, the third (as in East Africa also) ranging up into much later beds. The fourth species, *Gervillella orientalis*, was originally described from the Moghara massif of Sinai, where it is known from later collecting to occur in beds of undoubtedly Bathonian age. On the other hand, one of the species of the Pindiro Shales now described as new, *Ampullospira besairiei*, occurs in beds in Madagascar known to be Bajocian in age. It would thus appear that the palaeontological evidence as to whether the Pindiro Shales should be referred to the Bajocian or to the Bathonian is still inconclusive.

Bathonian Assemblages

Uncertainty about exact delimitation of Bathonian beds from those of earlier and later stages exists throughout East Africa (cf. Aitken 1961 : 17–19), and none of the Mollusca from Tanganyika here described can be unhesitatingly referred to this stage. It is, however, probable that specimens of *Liostrea dubiensis* (Contejean) from 1 mile and 2 miles west of Magindu Station, on the Tanganyika Central Railway, are from the Bathonian. In the Rahmu area of N.E. Kenya the Murri Limestones of Thompson & Dodson (1958 : 15) are considered to be largely or entirely Bathonian in age, and have yielded the three species *Brachidontes* (*Arcomytilus*) *asper* (J. Sowerby), *Chlamys curvivarians* (Dietrich) and *Lima* (*Plagiostoma*) *biiniensis* sp. nov., as recorded in the present memoir. Further species from those limestones have been recorded by Weir (1929), and also by Ayers (1952 : 27) on the basis of identifications by J. A. Douglas, and are listed by Thompson & Dodson (1958 : 19). Some of the determinations in question, for example, of the Oxfordian species *Cercomya siliqua* Agassiz and *Exogyra fourtaui* Stefanini, appear suspect.

The most interesting assemblage from beds of approximately Bathonian age in N.E. Kenya is that from the Asaharbito Beds of Thompson & Dodson (1958 : 21). Not all the provisional identifications originally cited have been confirmed, and the following revised list from this horizon (omitting forms identified only generically) can now be presented :

Grammatodon sublaevigatus (Zieten)
Liostrea dubiensis (Contejean)
Trigonia cf. *brevicostata* Kitchin
Astarte ayersi sp. nov.

Sphaeriola madridi (d'Archiac)
Corbula asaharbitensis sp. nov.
Cuspidaria ayersi sp. nov.

Unfortunately, the Asaharbito Beds have yielded no ammonites and on the basis of the assemblage listed above it is not possible to say anything more definite than that they are of Bathonian or Callovian age. The *Grammatodon* and *Sphaeriola*, both species found in Europe, suggest a Bathonian age, but *Trigonia brevicostata* occurs in India in the Callovian. *Liostrea dubiensis* is a widely distributed species with an extended geological range. So far, the two species most characteristic of the Bathonian rocks of Madagascar and N.W. India, *Protocardia grandidieri* (Newton) and *Corbula lyrata* J. de C. Sowerby, have not been reported from East Africa. Most of the previously described species identified in the Bathonian of this area have also been found in Europe. *Chlamys curvivarians* (Dietrich), however, a form with an extended geological range, is known only from E. and N.E. Africa, Arabia and India.

Callovian Assemblages

Callovian rocks are well developed in Tanganyika and Kenya, but in this case also it is not yet possible to determine exactly their upper and lower limits in the field. Aitken (1961 : 19-27) has compiled a list of the Mollusca recorded by earlier workers and collected by himself in beds in S.E. Tanganyika belonging to the "Upper Bathonian-Oxfordian" part of his Mandawa-Mahokondo Series and has indicated which of these are probably from the Callovian. The following list of Bivalvia and Gastropoda from the Callovian of this area is based on material examined by the present writer and on Aitken's records, marked with an asterisk in the case of species not represented in this material (the "*Ceromyopsis* sp." of Aitken is here identified as *Ceratomyopsis basochiana* (Defrance)) :

Grammatodon (*Indogrammatodon*) *virgatus* (J. de C. Sowerby)
**Lycettia indica* Cox
**Modiolus glendayi* Weir
Eopecten aubryi (Douvillé)
Entolium corneolum (Young & Bird)
Chlamys (*Spondylopecten*?) *badiensis* Cox
**Trigonia prora* Kitchin
Trigonia elongata J. de C. Sowerby
**Trigonia* aff. *propinqua* Kitchin
**Myophorella* (*Orthotrigonia*) cf. *kutchensis* (Kitchin)
**Astarte muelleri* Dacqué
Astarte unilateralis J. de C. Sowerby
Astarte aitkeni sp. nov.
**Ceratomya concentrica* (J. de C. Sowerby)
**Ceratomya* cf. *wimmisensis* (Gilliéron)
**Ceratomyopsis basochiana* (Defrance)
**Tellurimya telluris* (Lamarck)

Thracia viceliacensis d'Orbigny
Pseudorhytidopilus lonjiensis sp. nov.
Pseudomelania aspasia (d'Orbigny)
Bourguetia saemanni (Oppel)
Harpagodes aff. *oceani* (Brongniart)
Ampullospira quennelli sp. nov.
Akera tanganyicensis sp. nov.

According to Hennig's (1924 : 56) profile, Callovian beds are exposed along the Central Railway in Tanganyika in the cuttings from about 2 km. to nearly 4 km. east of Magindu Station, but he ignored the fact that Kinkelin's Callovian fossils, described by Dacqué (1910), came from very close to Magindu Station (see p. 7). As summarized by Aitken (*in* Quennell *et al.*, 1956 : 180), Hennig (1924 : 57–92) recorded a number of molluscan species from these beds, but some of the determinations need revision. The following Callovian species from this part of the railway are recorded in the present memoir :

Liostrea (*Catinula*) *alimena* (d'Orbigny)
Trigonia (*Frenguelliella*) *tealei* Cox
Astarte muelleri Dacqué
Ceratomyopsis basochiana (Defrance)
Ceratomya pittieri (de Loriol)
Pholadomya lirata (J. Sowerby)

To these may be added the following species, obtained from rocks of about the same age in the district south of Tarawanda, north of Magindu :

Grammatodon (*Indogrammatodon*) *stockleyi* Cox
Meleagrinella echinata (Smith)
Chlamys subtextoria (Münster)
Protocardia consobrina (Terquem & Jourdy)
Neritoma (*Neridomus*) aff. *gea* (d'Orbigny)

At localities near Tanga, in the extreme N.E. of Tanganyika, Callovian beds yielded the following species :

Grammatodon (*Indogrammatodon*) *virgatus* (J. de C. Sowerby)
Modiolus bipartitus J. Sowerby
Oxytoma inequivalvis (J. Sowerby)
Chlamys (*Spondylopecten*?) *badiensis* Cox
Trigonia (*Frenguelliella*) *tealei* Cox
Goniomya trapezicostata (Pusch)

In N.E. Kenya, at localities near the Daua river, the Rukesa Shales of Joubert (1960 : 13) are dated as Callovian on the evidence of a nautiloid cephalopod referred to *Paracenoceras* and of the bivalve assemblage. The presence of *Eligmus rollandi* Douvillé suggests that the succeeding Muddo Erri Limestones are at least in part not later than Callovian, although brachiopod evidence has been considered to indicate that these beds extend upwards into the Lower Oxfordian. Joubert (1960 : 14–15, 17–18) has compiled lists of molluscs and other invertebrates which have been cited from these formations. Species represented in the collections examined by the present writer may be listed as follows (R, Rukesa Shales ; ME, Muddo Erri Limestones) :

Brachidontes (*Arcomytilus*) *asper* (J. Sowerby). ME
Brachidontes (*Arcomytilus*) *laitmairensis* (de Loriol). ME
Eligmus rollandi Douvillé. ME
Entolium corneolum (Young & Bird). ME
Eopecten aubryi (Douvillé). R, ME
Camptonectes auritus (Schlotheim). ME
Chlamys curvivarians (Dietrich). R, ME
Lima (*Plagiostoma*) cf. *schardti* de Loriol. R, ME
Lima (*Plagiostoma*) cf. *jumaraensis* Cox. ME
Lima (*Plagiostoma*) *muddoensis* sp. nov. ME
Pseudolimea duplicata (J. de C. Sowerby). ME
Lopha costata (J. de C. Sowerby). R, ME
Lopha gregarea (J. Sowerby). R, ME
Liostrea (*Catinula*) *alimena* (d'Orbigny). R, ME
Lucina cf. *lirata* Phillips. ME
Mactromya aequalis Agassiz. R, ME
Ceratomyopsis basochiana (Defrance). R, ME
Anisocardia minima (J. Sowerby). R
Pholadomya lirata (J. Sowerby). R
Pholadomya ovalis (J. Sowerby). ME
Homomya inornata (J. de C. Sowerby). R
Ceratomya concentrica (J. de C. Sowerby). R, ME
Ceratomya wimmisensis (Gilliéron). ME

If these lists of Callovian species are examined it would appear that the East African assemblages during that stage differed less from those living contemporaneously in Europe than during the Bajocian and Toarcian. The number of species, whether new or previously described, unknown from Europe is relatively small. Previously described species in these lists known only from East Africa are *Grammatodon* (*Indogrammatodon*) *stockleyi*, *Trigonia* (*Frenguelliella*) *tealei* and *Astarte muelleri*. Species common to India and East Africa but unknown from Europe are *Grammatodon* (*Indogrammatodon*) *virgatus*, *Lycettia indica*, *Modiolus glendayi*, *Eopecten aubryi*, *Chlamys curvivarians*, *Chlamys* (*Spondylopecten?*) *badiensis*, *Trigonia prora*, and *Astarte unilateralis* (omitting those forms of which the identifications are qualified). The incoming of the subgenus *Indogrammatodon*, abundant in this region as well as in Arabia and N.W. India but unknown in Europe, may be particularly noted at this stage.

Oxfordian Assemblages

Aitken (1961 : 21) has listed a series of ammonites which establish the Upper Oxfordian age of part of the succession in the area of southern Tanganyika dealt with in his paper, but the only identified bivalve species collected by him at one of the same localities seems to be *Grammatodon* (*Indogrammatodon*) *virgatus* (J. de C. Sowerby). Material from the same area collected by geologists of the British Petroleum Company Ltd. includes a number of bivalves and gastropods stated to come from Upper Oxfordian beds. These may be listed as follows :

Eopecten aubryi (Douvillé)
Pseudolimea mandawaensis sp. nov.
Liostrea polymorpha (Münster)
Astarte sowerbyana Holdhaus
Pholadomya hemicardia Roemer
Pleuromya calceiformis (Phillips)

Aitken's locality WA. 1817, which he informs me is probably Upper Oxfordian, has yielded the gastropod recorded herein as *Nerinella ?muelleri* Cox, associated with *Grammatodon* (*Indogrammatodon*) *virgatus* and an indeterminate perisphinctid ammonite.

Ammonite-bearing Oxfordian beds in the Bagamoyo hinterland of Tanganyika have yielded the following species, as also recorded in the present memoir :

Grammatodon (*Indogrammatodon*) *stockleyi* Cox
Pteria tanganyicensis sp. nov.
Meleagrinella radiata (Trautschold)
Entolium corneolum (Young & Bird)
Limatula moorei sp. nov.
Gryphaea hennigi Dietrich
Trigonia (*Frenguelliella*) *tealei* Cox
Astarte episcopalis de Loriol
Fimbria quennelli sp. nov.
Pleuromya uniformis (J. Sowerby)
Goniomya literata (J. Sowerby)
Bourguetia saemanni (Oppel)

No extensive collections of Oxfordian bivalves have yet been made in the coastal area of Kenya, although a few species were recorded by Weir in the *Hunterian Museum Monographs.* In the Tajabba-Wergudud area of N.E. Kenya Saggerson & Miller (1957 : 13) have referred to the Oxfordian a series of pink and yellow fossiliferous limestones to which they have given the name Golberobe Beds. Unfortunately, however, there is no ammonite evidence for the exact dating of these deposits. Bivalves from these beds which have been named specifically and are dealt with in the present memoir are as follows :

Modiolus imbricatus (J. Sowerby)
Modiolus (*Inoperna*) *sowerbianus* (d'Orbigny)
Mytilus (*Falcimytilus*) *tifoensis* sp. nov.
Mytilus (*Falcimytilus*) *dietrichi* sp. nov.
Brachidontes (*Arcomytilus*) *laitmairensis* (de Loriol)
Gervillia saggersoni sp. nov.
Gervillella siliqua (Eudes-Deslongchamps)

Meleagrinella radiata (Trautschold)
Lopha solitaria (J. de C. Sowerby)
Lopha tifoensis sp. nov.
Liostrea dubiensis (Contejean)
Exogyra nana (J. Sowerby)
Mactromya quadrata (Roemer)
Corbula kailtaensis sp. nov.

Of the above species, *Meleagrinella radiata* occurs in abundance at one horizon.

Further north, near the Daua river, the Rahmu Shales of Joubert (1960 : 19) are referred to the Oxfordian on ammonite evidence and have yielded the following bivalves, as now identified :

Mytilus (*Falcimytilus*) *jurensis* Roemer
Camptonectes auritus (Schlotheim)
Lima (*Plagiostoma*) *rahmuensis* sp. nov.
Lopha gregarea (J. Sowerby)
Lopha solitaria (J. de C. Sowerby)
Lopha cf. *intricata* (Contejean)
Exogyra nana (J. Sowerby)
Protocardia rahmuensis sp. nov.
Homomya rahmuensis sp. nov.

The succeeding Seir Limestones of Joubert (1960 : 20) have been dated as at least in part Upper Oxfordian (*transversarium* Zone) on ammonite evidence, although it is thought that their upper part may belong to the Lower Kimmeridgian. It is probable that all of the following forms dealt with in the present memoir, which are mainly from the Wilderri Hill and Dussé localities, are from the Oxfordian part of the limestones :

Grammatodon (*Indogrammatodon*) *stockleyi* Cox
Grammatodon (*Indogrammatodon*) *irritans* (Hennig)
Mytilus (*Falcimytilus*) *jurensis* Roemer
Stegoconcha gmuelleri (Krenkel)
Meleagrinella radiata (Trautschold)
Entolium corneolum (Young & Bird)
Camptonectes auritus (Schlotheim)
Eopecten thurmanni (Brauns)
Eopecten aff. *albus* (Quenstedt)
Chlamys (*Radulopecten*) *inaequicostata* (Young & Bird)
Pseudolimea duplicata (J. de C. Sowerby)
Lopha gregarea (J. Sowerby)
Lopha solitaria (J. de C. Sowerby)
Liostrea dubiensis (Contejean)
Astarte huralensis Stefanini
Ceratomya wilderriensis sp. nov.
Mactromya quadrata (Roemer)
Pseudomelania (*Rhabdoconcha*) *wilderriensis* sp. nov.

Bourguetia saemanni (Oppel)
Pietteia dusseensis sp. nov.
Ampullospira dejanira (d'Orbigny)
Globularia phasianelloides (d'Orbigny)
Nerinella cutleri sp. nov.

Species known to occur in Europe in beds belonging to the same stage predominate in these Oxfordian assemblages. The number of forms described as new is not large, and previously described species known only from East Africa consist merely of *Grammatodon* (*Indogrammatodon*) *stockleyi*, *Trigonia* (*Frenguelliella*) *tealei* and *Astarte huralensis*. Species common to East Africa and India but unknown from Europe are *Grammatodon* (*Indogrammatodon*) *virgatus*, *Astarte sowerbyana*, *Eopecten aubryi*, *Gryphaea hennigi* and *Stegoconcha gmuelleri*. The subgenus *Indogrammatodon* continues to be well represented.

Kimmeridgian Assemblages

In the area of southern Tanganyika dealt with in his memoir Aitken (1961 : 24–31) distinguishes between the Septarian Marl, yielding Lower Kimmeridgian ammonites (perhaps also Upper Oxfordian ones at the base of the formation) and the Tendaguru Series, the lower part of which is classified as Middle-Upper Kimmeridgian and the upper part as Upper Kimmeridgian-Tithonian. Aitken (1961 : 29) suggests that the marine beds at Tendaguru itself all belong to the last of these divisions.

The same worker (1961 : 25–26) has compiled a list of bivalves found in the Septarian Marl based on the records of German workers. No specimens from this formation have been examined in the course of the present work. He has also recorded six named species and a number of forms identified only generically from his Middle-Upper Kimmeridgian division of the Tendaguru Series. No bivalves from this division have been examined in the course of the present work, but the following gastropods from Dr. Aitken's collection are described :

Bathrotomaria aitkeni sp. nov.
Lissochilus stremmei Dietrich
Pseudomelania vittata (Phillips)
Pseudomelania (*Oonia*) *aitkeni* sp. nov.
Globularia aff. *phasianelloides* (d'Orbigny)
Pseudonerinea clio (d'Orbigny)
Nerinella mandawaensis sp. nov.

The presence of *Pseudonerinea clio* at this horizon is in keeping with its known occurrences in Europe, but the presence of *Pseudomelania vittata*, a Cornbrash species in Europe, in the Kimmeridgian of East Africa, is worthy of comment. As now suggested in the discussion of this species, it is, however, possible that the distinctions drawn between it and certain related but supposedly distinct species by European workers are of no significance.

The following is a combined list of the species now recorded from the " Upper Kimmeridgian-Tithonian " division of Aitken's Tendaguru Series in the Mandawa-

Mahokondo area (M) and in the Tendaguru area (T):

Grammatodon (*Indogrammatodon*) *irritans* (Hennig). T
Grammatodon (*Indogrammatodon*) *matapwaensis* sp. nov. T
Apolinter kindopeensis sp. nov. T
Cucullaea kipandeensis sp. nov. T
Lithophaga suboblonga Dietrich. T
Modiolus bipartitus (J. Sowerby). T
Modiolus (*Inoperna*) *perplicatus* (Étallon). T
Mytilus (*Falcimytilus*) *dietrichi* sp. nov. T
Brachidontes (*Arcomytilus*) *laitmairensis* (de Loriol). M
Musculus kindopeensis sp. nov. T
Gervillella aviculoides (J. Sowerby). T
Pinna constantini de Loriol. T
Stegoconcha gmuelleri (Krenkel). T
Oxytoma inequivalvis (J. Sowerby). T
Meleagrinella radiata (Trautschold). T
Bositra somaliensis (Cox). T
Entolium corneolum (Young & Bird). T
Chlamys matapwaensis sp. nov. M
Chlamys (*Radulopecten*) *kinjeleensis* sp. nov. T, M
Lima (*Acesta*) *kindopeensis* sp. nov. T
Lima (*Acesta*) *cutleri* sp. nov. T
Pseudolimea duplicata (J. de C. Sowerby). T
Limatula migeodi sp. nov. T
Lopha hennigi (Dietrich). T
Lopha? *kindopeensis* sp. nov. T
Liostrea dubiensis (Contejean). T
Exogyra nana (J. Sowerby). T
Trigonia migeodi sp. nov. T
Trigonia (*Indotrigonia*) *africana* Aitken [*smeei* auct.]. T
Trigonia (*Indotrigonia*) *dietrichi* Lange. T
Myophorella kiwawaensis sp. nov. M
Laevitrigonia dwanika sp. nov. T
Opisthotrigonia curta (Aitken). M
Hippopodium quenstedti (Dietrich). T
Astarte subobovata Dietrich. T
Astarte recki Dietrich. T
Astarte sowerbyana Holdhaus. T
Astarte weissermeli Dietrich. M, T
Astarte mandawaensis sp. nov. M
Astarte lonjiensis sp. nov. M
Astarte mitoleensis sp. nov. M
Coelastarte dietrichi sp. nov. T
Seebachia janenschi Dietrich. M

Lucina cutleri sp. nov. T
Sphaera subcorrugata Dietrich. T
Protocardia schencki Müller. T
Protocardia suprajurensis (Contejean). M
Protocardia (*Tendagurium*) *propebanneiana* (Dietrich). T
Anisocardia kinjeleensis sp. nov. T
Eomiodon dinosaurianum sp. nov. T
Eomiodon (*Africomiodon*) *cutleri* sp. nov. T
Homomya hortulana Agassiz. T
Pleuromya uniformis (J. Sowerby). T
Nummocalcar mitoleensis sp. nov. M
Scurriopsis (*Dietrichiella*) *kindopensis* (Dietrich). T
Chrysostoma staffi Dietrich. T
Lissochilus stremmei Dietrich. T
Chartronella mitoleensis sp. nov. M
Pseudomelania (*Oonia*) *dietrichi* sp. nov. T
Purpuroidea aff. *gigas* (Thurmann & Étallon). M
Paracerithium lonjiense sp. nov. M
Cossmannea hennigi (Dietrich). T
Nerinella cutleri sp. nov. T

South of the Daua river, in N.E. Kenya, the Hereri Shales of Joubert (1960 : 24) are referred to the Kimmeridgian mainly on stratigraphical grounds, as no ammonites identifiable with certainty have been found in them. The following species from Hereri are recorded in the present work :

Grammatodon (*Indogrammatodon*) *irritans* (Hennig)
Mytilus (*Falcimytilus*) *jurensis* Roemer
Eopecten thurmanni (Brauns)
Chlamys curvivarians (Dietrich)
Exogyra nana (J. Sowerby)
Protocardia (*Tendagurium*) *bannesiana* (Contejean)
Ceratomyopsis striata (d'Orbigny)
Ceratomya excentrica (Roemer)
Bourguetia saemanni (Oppel)

The presence of *Protocardia bannesiana* appears, from its known European occurrences, to confirm the Kimmeridgian age of the above assemblage.

In the same area the succeeding Dakacha Limestones are considered by Joubert (1960 : 28) as " probably bridging the uppermost Kimmeridgian and the lowest part of the Tithonian ", thus being approximately contemporaneous with the dinosaur beds of Tendaguru. No ammonites have been found in them, but they have yielded the following bivalves and gastropods, described in the present work :

Nuculoma (*Palaeonucula*) *bellozanensis* sp. nov.
Modiolus virgulinus (Thurmann & Étallon)
Modiolus (*Inoperna*) *perplicatus* (Étallon)

Chlamys curvivarians (Dietrich)
Lima (*Plagiostoma*) *sublaeviuscula* Krumbeck
Ctenostreon proboscideum (J. Sowerby)
Lopha gregarea (J. Sowerby)
Rutitrigonia stefaninii (Venzo)
Mactromya quadrata (Roemer)
Quenstedtia jouberti sp. nov.
Ceratomya excentrica (Roemer)
Pholadomya hemicardia Roemer
Harpagodes thirriae (Contejean)
Globularia hemisphaerica (Roemer)
Globularia hennigi sp. nov.
Trochalia depressa (Voltz)

The assemblage listed above includes none of the characteristic trigoniids or other elements of the Tendaguru fauna. The occurrence of such species as *Modiolus virgulinus* and *Harpagodes thirriae*, found apparently in the top bed of the Dakacha Limestones (Joubert 1960 : 27), suggests, from the known European occurrences of these species, that this bed is Kimmeridgian in age (even in the more restricted sense) and not later. The presence of *Rutitrigonia stefaninii*, however, serves as a link between this fauna and that of the beds at Cud Finagubi, discussed a little later, and is interesting as constituting the earliest known occurrence of *Rutitrigonia*.

If the East African Kimmeridgian assemblages listed above are considered as a whole, it will be seen that, while, like those from lower horizons, they include a large number of species found in the Jurassic of Europe, they have an Indian element which is rather more pronounced than in the earlier faunas. Affinity with the Indian fauna is particularly marked among the trigoniids, as seen by the abundance (in southern Tanganyika) of *Indotrigonia* and by the presence there of *Opisthotrigonia*. Other forms common to the two areas but not found in Europe are *Astarte sowerbyana* Holdhaus and *Stegoconcha gmuelleri* (Krenkel). *Indogrammatodon* continues to be an important element of the African fauna, although the actual species of Kimmeridgian age here recorded are distinct from those found in India. The only known post-Liassic occurrence of the genus *Hippopodium* is in these East African beds, while it is interesting to find in the Upper Jurassic of this region the remarkable astartid genus *Seebachia*, otherwise known only from South Africa, where it occurs in the Neocomian. Quite a number of Kimmeridgian species, some here described as new and others described in earlier monographs by Müller, Dietrich, Hennig and Aitken, have so far been found only in East Africa.

In the extreme north-east of Kenya a series of beds is developed the age of which has given rise to some controversy. Termed by Dixey (1948 : 84) the Mandera Series, these beds have been described by Joubert (1960 : 31–39), who cites evidence from N.E. of Melka Dakacha that they succeed the Dakacha Limestones conformably. Some 40 ft. from the base of this series is a fossiliferous deposit (the basal bed of the subdivision termed by Joubert the Gudediye Beds) yielding the two bivalve species here described as *Tancredia manderaensis* sp. nov.

and *Myopholas manderaensis* sp. nov. Some hundreds of feet higher (according to Joubert's reading of the succession), and separated from this bed by almost unfossiliferous deposits, are the Finaguba Beds, which are of interest to palaeontologists as yielding the assemblage monographed and regarded as of Bathonian age by Venzo (1949). No specimens from the locality Cud Finagubi itself (the source of most of Venzo's material) have been examined, but a short discussion on the age of this assemblage, based on his illustrations, may be appropriate at this point.

The most abundant fossils are trigoniids, belonging to what I would regard as only two species, *Trigonia dainellii* Venzo (this includes specimens identified by Venzo as the Callovian species *T. brevicostata* Kitchin) and *T. stefaninii* Venzo. *T. dainellii* belongs to a subgenus of *Trigonia* which has not yet received a name but is represented in the Upper Jurassic of Europe by a species identified by de Loriol (1868 : 160, pl. 10, figs. 12–16 ; 1872 : 295, pl. 16, fig. 20) as *Trigonia truncata* Agassiz. In the Yonne Department of France this species occurs (de Loriol 1868 : 252) only a few feet below the Cretaceous in beds which appear to be referable to the Portlandian (as restricted by British geologists), but in the Haute-Marne it occurs (de Loriol 1872 : 498, 499) in beds which would be included in the Kimmeridgian in the British sense, while in northern Germany Credner (1863 : 22, 36) records it from well down in the Kimmeridgian. The similarity between *T. dainellii* and *T. truncata*, possibly amounting to the specific identity of the two forms, thus strongly suggests that the Finaguba Beds are Upper Jurassic (Kimmeridgian or Portlandian) in age. The second trigoniid, *Trigonia* [now *Rutitrigonia*] *stefaninii* Venzo, has already been commented upon when discussing the fauna of the Dakacha Limestones. Although belonging to a genus previously reported only from the Cretaceous, the presence of this species in N.E. Kenya in beds of which the Upper Jurassic age could not be disputed shows that it does not provide evidence for a Cretaceous age for the Finaguba Beds. Apart from the trigoniids and some small nondescript oysters, these beds yielded a large number of internal moulds of bivalve shells not all identifiable with any certainty even generically. Venzo's application to these of the names of such Bathonian species as *Eonavicula eudesii* (Morris & Lycett), *Anisocardia loweana* (Morris & Lycett), *Sphaera madagascariensis* (Newton) and *Quenstedtia morrisi* (Cossmann) has no stratigraphical significance. The same remark applies to the identification of *Grammatodon* (*Indogrammatodon*) *virgatus* (J. de C. Sowerby) in this fauna. This subgenus *Indogrammatodon* is undoubtedly represented by more than one species, but it is not obvious what specific names should be applied to such poor material. My present view, taking into consideration the stratigraphical evidence adduced by Joubert, is that the Finaguba Beds are of Upper Kimmeridgian if not of still later Jurassic age.

The beds of the Mandera Series are succeeded by deposits for which the term Marehan Series has been adopted (Saggerson & Miller 1957 : 23 ; Joubert 1960 : 39). The lower of the two divisions of this series (the Danissa Beds) has been dated as Lower Cretaceous on palaeobotanical evidence which is not altogether convincing. A fossiliferous horizon in these beds has yielded a form (*Trigonia dainellii* Venzo) already discussed and, limited though this evidence is, it favours the inclusion of the Danissa Beds, like the Mandera Series below them, in the Jurassic.

IV SYSTEMATIC DESCRIPTIONS

Class **BIVALVIA** Linnaeus

Superfamily **NUCULACEA**

Family **CTENODONTIDAE** Wöhrmann 1893

Genus ***PALAEONEILO*** Hall 1869

Palaeoneilo asaharbitensis sp. nov.

Pl. 1, fig. 1

Diagnosis. Of medium size for the genus (length of holotype 20 mm.), subelliptical, height about three-fifths of length ; moderately inequilateral, with the umbo near the anterior third of the length ; inflation rather strong for the genus. Umbo narrowly rounded, its outline continuous with the almost straight, gently sloping postero-dorsal outline of the shell ; antero-dorsal outline strongly excavated. Anterior margin broadly rounded, posterior margin more narrowly rounded, ventral margin strongly and nearly symmetrically convex. Details of ornament unknown.

Holotype. No. L.83864, the internal mould of a left valve. The only specimen.

Locality and horizon. 1 mile N. of Asaharbito, N.E. Kenya ; Bathonian [? or Callovian], Asaharbito Beds.

Remarks. The muscle scars and pallial line are not seen in the holotype, and impressions of taxodont teeth, while clearly visible along the postero-dorsal and antero-dorsal margins, are obscured immediately below the umbo. Hence the reference of the species to the genus *Palaeoneilo* is based on its general morphology. The most closely comparable form described from the Middle or Upper Jurassic is *P. longiuscula* (de Loriol) (1899 : 159, pl. 10, figs. 23–25, *ex* Merian MS.), Lower Oxfordian of Switzerland, which is slightly more elongate.

Family **NUCULIDAE**

Genus ***NUCULOMA*** Cossmann 1907

Subgenus ***PALAEONUCULA*** W. Quenstedt 1930

Nuculoma* (*Palaeonucula*) *bellozanensis (de Loriol)

Pl. 1, figs. 3*a*, *b*

1875. *Nucula bellozanensis* de Loriol : 138, pl. 17, figs. 16*a–c*.

Material. One specimen (no. L.92293).

Locality and horizon. 2 miles S. of Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

Remarks. This small, evenly ovate specimen, which is just under 10 mm. long, agrees so well in size and shape with de Loriol's figures of *N. bellozanensis* that there seems no reason to qualify its identification. Of other comparable species, *Nucula saxatilis* Contejean (1860 : 284, pl. 21, fig. 13), from the Kimmeridgian of the French Jura, is less elongate. *Nucula ornati* Quenstedt (1851 : 528, pl. 44, fig. 7), which, if Quenstedt's conception of the species is accepted, ranges in Europe from the Upper Bajocian to the Oxfordian, has a slightly more prominent umbo. De Loriol's types of *N. bellozanensis* were from the Lower Kimmeridgian of northern France.

I follow Van de Poel (1955) in regarding *Palaeonucula* as a subgenus of *Nuculoma* rather than of *Nucula*.

Family **NUCULANIDAE**

Genus ***NUCULANA*** Link 1807

Subgenus ***DACRYOMYA*** Agassiz 1840

Nuculana (Dacryomya) thompsoni sp. nov.

Pl. 1, figs. 4*a*, *b*, *c*

Specific name. After Mr. A. O. Thompson, of the Geological Survey of Kenya, collector of the holotype.

Diagnosis. Small (length of holotype 8·6 mm.), pyriform, height two-thirds of length ; gibbose ; with strongly opisthogyrous, submedian umbones and a short posterior rostrum the narrow extremity of which is slightly below mid-height. Postero-dorsal outline strongly concave ; escutcheon broad, cordate, well impressed, bordered by umbonal ridges. Antero-dorsal outline and anterior and antero-ventral margins forming an uninterrupted, parabolic curve ; posterior end of ventral margin almost straight. Surface, except for the smooth escutcheon, ornamented with regular concentric threads, the tops of which are about 0·2 mm. apart.

Holotype. No. LL.35000. The only specimen.

Locality and horizon. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

Remarks. *Nuculana zieteni* (Brauns) (1871 : 373) (*non* d'Orbigny sp.), Middle Lias of Europe, is less gibbose and has its posterior rostrum accentuated by a sinus of the ventral margin. The type species of *Dacryomya*, *Nuculana lacryma* (J. de C. Sowerby) (1824*a* : 119, pl. 476, fig. 3), Bathonian of Europe and Asia, is less gibbose and has a more elongate rostrum. In *Nuculana gutta* (Münster) (= *Nucula mucronata* Goldfuss 1837, pl. 125, figs. 9*a–d*, *non* Sowerby), also known as *N. diana* (d'Orbigny), Toarcian and Aalenian of Europe, the postero-dorsal profile is less strongly concave and the rostrum less well defined.

Nuculana (*Dacryomya*) *dodsoni* sp. nov.

Pl. 1, figs. 2*a*, *b*, *c*

Specific name. After Mr. R. G. Dodson, of the Geological Survey of Kenya.

Diagnosis. Of medium size (length of largest specimens 15 mm.), pyriform, with the height slightly exceeding half the length ; inflation moderate ; with strongly opisthogyrous umbones placed just anterior to mid-length and a slightly upcurved posterior rostrum, the extemity of which is truncated and situated below mid-height. Postero-dorsal outline strongly concave ; antero-dorsal outline and anterior and ventral margins forming an uninterrupted, parabolic curve, the ventral margin convex as far as its posterior extremity. External features of shell unknown.

Holotype and paratypes. Numerous internal moulds exposed, together with moulds of a species of *Nucula*, on a bedding plane of hard brownish limestone. The holotype (no. L.98280) is the specimen represented in Pl. 1, fig. 2*c*.

Locality and horizon. Hagardulun, 25 miles N.E. of Tarbaj, N.E. Kenya ; Bathonian-Callovian, Bur Mayo Limestones.

Remarks. *Nuculana decorata* (Douvillé) (1916 : 61, pl. 5, figs. 56–62), Bathonian of Sinai, is very similar to this species, but differs in its broader umbonal region. The widespread Bathonian species *N. lacryma* (J. de C. Sowerby) has a more sharply pointed and upcurved rostrum and a more strongly convex ventral margin. The Callovian species *N. moreana* (d'Orbigny) (types figured by Cottreau 1925 : 12, pl. 38, figs. 4, 5), which is doubtfully distinct from *N. lacryma*, differs in the same manner. The Toarcian-Aalenian species *N. rostralis* (Lamarck) (type figured by Favre 1914, pl. 35, figs. 242*a*, *b*) has less prominent umbones and a less strongly concave postero-dorsal margin. The Oxfordian species *N. acuta* (de Loriol) (1899 : 164, pl. 10, figs. 29–32, *ex* Merian, MS.) has a narrower posterior extremity, a less concave postero-dorsal margin, and a distinct sinus at the posterior end of the ventral margin. *N. matheyi* (Rollier) (1912 : 62, pl. 6, fig. 5), another Oxfordian species, has a less prominent umbo.

Subgenus ***RYDERIA*** Wilton 1830

Nuculana (*Ryderia*) *kenyana* sp. nov.

Pl. 1, figs. 6*a*, *b*, *c*

Diagnosis. Of medium size (height up to 9 mm., original length possibly three times that amount), very compressed, inequilateral, with an evidently long posterior rostrum, the extremity of which, however, is broken away in all the specimens. Umbones very obtuse, only feebly opisthogyrous, level with the almost straight, sub-horizontal antero-dorsal margin. Anterior margin flattened, forming an obtuse angle with antero-dorsal margin ; ventral margin almost straight except for a slight sinus at beginning of posterior rostrum. Postero-dorsal outline feebly concave ; escutcheon narrow, shallow, bordered by umbonal ridges which are well defined only near the umbones. Surface apparently bearing concentric threads and rugae (the former, however, almost obliterated by erosion in the available specimens).

HOLOTYPE AND PARATYPES. Nos. LL.35001 and LL.35002–04 respectively, four specimens in all.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. This species differs from the European Upper Liassic species *Nuculana rostralis* (Lamarck) (synonym, *N. claviformis* (J. de C. Sowerby) (1824*a* : 119, pl. 476, fig. 2)) in its more compressed form, its almost horizontal and more extended antero-dorsal margin, and its flatter anterior margin. It is more closely comparable to *N.* (*Ryderia*) *doris* (d'Orbigny) (= *Nucula complanata* Goldfuss 1837, pl. 125, figs. 11*a–c*, *non* Phillips) and *N.* (*R.*) *graphica* (Tate) (1870 : 407, pl. 26, fig. 12), both of Liassic (Pliensbachian) age, but it differs from these species in its more quadrate anterior end and its flatter ventral margin.

Lemoine (1906 : 112) recorded *N. doris* from a locality south of Kola, Madagascar, where it was associated with a *Posidonia* identified as *P. alpina* Gras, and where he thought the beds might be Aalenian in age. As the specimens from that locality have not been figured, it is impossible to say if they belong to the species now described.

Subgenus **PRAESACCELLA** Cox 1940

Nuculana* (*Praesaccella*) *camelorum sp. nov.

Pl. 2, figs. 10*a*, *b*

1960. *Nuculana* (*Praesaccella*) cf. *juriana* Cox ; Thompson & Dodson : 23 (listed).

DIAGNOSIS. Of medium size for the genus (length of largest specimen 9·3 mm.), pyriform, with height about one-half of length ; inflation rather weak ; with obtusely subangular umbones placed at about anterior third of length and an acutely pointed posterior extremity which is almost at mid-height. Postero-dorsal outline straight or slightly concave ; escutcheon narrow, not well seen in available specimens. Antero-dorsal outline and anterior and ventral margins forming an uninterrupted curve ; ventral margin in some specimens convex as far as its extremity, in others with a small sinus at its posterior end. Ornament of very fine, regular concentric threads.

HOLOTYPE AND PARATYPES. Numerous specimens exposed on a bedding-plane of hard brownish limestone. The holotype (no. L.98280) is the one represented in the bottom right-hand corner of Pl. 2. fig. 10*b*.

LOCALITY AND HORIZON. Camel track about 5 miles S. of Singu and 9 miles E. of Tarbaj, N.E. Kenya ; Toarcian or Bajocian, top of Didimtu Beds.

REMARKS. *Nuculana* (*Praesaccella*) *juriana* Cox (1940 : 33, pl. 2, figs. 6–9), from the Oxfordian of Cutch, India, is less inequilateral, higher in proportion to its length, and ornamented with slightly coarser concentric threads. No more closely comparable species can be cited.

Genus ***ROLLIERIA*** Cossmann 1920

Rollieria aequilatera (Koch & Dunker)

Pl. 1, figs. 5*a*, *b*, *c*

1837. *Tellina aequilatera* Koch & Dunker : 30, pl. 2, fig. 9.
1850*a*. *Leda delila* d'Orbigny : 253.
1869. *Leda aequilatera* (Dunker & Koch) ; Brauns : 267.
1908*a*. *Leda delila* d'Orbigny ; Thevenin : 57, pl. 14, figs. 28–30.

MATERIAL. One specimen (no. LL.35005).

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. *Rollieria* includes the small, ovate, equilateral, compressed nuculanids which range throughout the Jurassic and are difficult to separate into species. Elsewhere (Cox 1936 : 464) I have applied the name *Nuculana* (*Rollieria*) *bronni* (Andler) to a species ranging from Lower to Middle Lias. I refer the present Upper Liassic specimen to *R. aequilatera* (Koch & Dunker), a species based on an Inferior Oolite specimen, and I place *Leda delila* d'Orbigny, based on a Toarcian specimen, in synonymy, as was suggested by Brauns (1869). The range of *R. aequilatera* extends, according to that author, to the *ornatus*-beds (Callovian). The specimen from the Yorkshire Upper Lias figured as *Leda aequilatera* by Tate (1876, pl. 11, fig. 10) was wrongly identified and not even a *Rollieria*. The present specimen from Kenya, which is 9 mm. long, has the outline of a typical *Rollieria*, and is referred to the genus with confidence although it shows no hinge-teeth.

Superfamily **ARCACEA**

Family **PARALLELODONTIDAE** Dall 1898

Genus ***PARALLELODON*** Meek & Worthen 1866

Parallelodon pindiroensis sp. nov.

Pl. 1, figs. 7*a*, *b*, 8*a*, *b*

DIAGNOSIS. Of medium size (length of holotype c. 33 mm.), subrectangular to trapeziform in shape, variable also in ratio of length to height. Umbones rising very little above hinge-margin, broadly rounded or with a slight median depression ; beaks at anterior third or quarter of length of shell. Hinge-margin extended posteriorly as a short, acutely pointed wing, the tip of which lies almost exactly above posterior end of body of shell. Posterior area much compressed, not separated from the flank by a distinct carina, but bordered near the umbo by a broadly rounded ridge which soon dies out. A median depression of the flank and a corresponding broad sinus of the ventral margin are variably developed. Cardinal area rather narrow. Posterior area bearing very weak radial riblets, the remainder of the surface radial threads which are obscure except on the antero-dorsal region ; growth-rugae present at irregular intervals.

HOLOTYPE AND PARATYPES. Nos. LL.35086 and LL.35087–88 respectively, three specimens in all, *ex* B.P. Coll.

LOCALITY AND HORIZON. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika ; Bajocian (?), Pindiro Shales.

REMARKS. The variability is illustrated by the following measurements of the holotype and of the better preserved paratype. Holotype : length 33·3 mm., height 17·0 mm., inflation 12·5 mm. Paratype : length 32·5 mm., height 18·2 mm., inflation 13·5 mm.

Parallelodon elongatus (J. de C. Sowerby) (1824*a*: 67, pl. 447, fig. 1), a widespread European Bajocian species, and *P. buckmani* (Richardson) (1843 : 504, text-fig. 243), Lower Lias of England, are more elongate, less compressed postero-dorsally, and without the wing-like extension of the hinge-margin.

Genus *GRAMMATODON* Meek & Hayden 1860

Grammatodon kenyanus sp. nov.

Pl. 2, figs. 1*a*, *b*, *c*, 2*a*, *b*

DIAGNOSIS. Small (length of largest specimen 15 mm.), rectangularly ovate, not much elongated (height two-thirds of length), well inflated, most so just posterior to middle of shell. Umbones at about anterior two-fifths of length, broadly rounded except for a slight median depression, projecting slightly above hinge-margin. Posterior margin nearly straight, meeting hinge-margin in a fairly well-marked, slightly obtuse angle. Posterior area somewhat compressed dorsally, not separated from flank by a carina. Ornament consisting of concentric ribs which become irregular in later growth-stages ; radial threads, traces of which are seen in places, may have been present on the whole surface, but, if so, have been largely removed by erosion in the available specimens.

HOLOTYPE AND PARATYPES. Nos. LL.35006 and LL.35007–09 respectively, four specimens in all.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. As the hinge-structure cannot be observed, it is not certain that this species belongs to *Grammatodon* rather than to *Cucullaea*, but it is included in the former genus on account of its small size. It is less elongate but has a relatively longer hinge-margin than *G. muensterii* (Zieten) (1833 : 75, pl. 56, figs. 7*a–c*), Middle [?-Upper] Lias of Europe, and also differs in the presence of the concentric ribs.

Grammatodon sublaevigatus (Zieten)

Pl. 2, fig. 7

1833. *Cucullaea sublaevigata* Hartmann [MS.] ; Zieten : 75, pl. 56, figs. 3*a–c*.
1837. *Arca cucullata* Münster [MS.] ; Goldfuss : 148, pl. 123, figs. 7*a–c*.
1837. *Arca concinna* (Phillips) ; Goldfuss : 148, pl. 123, figs. 6*a*, *b* (*non Cucullaea concinna* Phillips).
1952. *Grammatodon* cf. *bathonicus* Cox & Arkell ; Ayers : 22.

Material. Two internal moulds (nos. L.83863, L.83869) preserved in pink limestone with numerous other bivalve remains.

Locality and horizon. 1 mile N. of Asaharbito, N.E. Kenya ; Bathonian [? or Callovian], Asaharbito Beds.

Remarks. Largely owing to differences in the state of preservation of material from different formations, specific discrimination among the Bajocian, Bathonian and Callovian forms of the group of *Grammatodon concinnus* (Phillips), itself a species of Oxfordian age, presents some difficulty. Zieten's *Cucullaea sublaevigata* was the first species of this group to be founded on specimens from one of these stages (Bajocian), and, since his figure agrees quite well with the specimens now recorded, particularly the more elongate one, his specific name is here applied to them. Later names which seem to be synonymous with it include *Cucullaea inflata* Roemer (1836 : 105, pl. 6, fig. 22), *Arca cucullata* Goldfuss 1837, *Arca subconcinna* d'Orbigny 1850 (= *Arca concinna* Goldfuss, 1837, pl. 123, figs. 6*a*, *b*, *non* Phillips sp.), *Grammatodon goldfussi* Arkell 1930 (based on the same figures of Goldfuss), and possibly *G. bathonicus* Cox & Arkell 1948 (= *Cucullaea concinna* Morris & Lycett 1853, pl. 5, fig. 7, *non* Phillips sp.).

Subgenus ***INDOGRAMMATODON*** Cox 1937

Grammatodon (Indogrammatodon) virgatus (J. de C. Sowerby)

Pl. 2, figs. 4, 5

1840*b*. *Cucullaea virgata* J. de C. Sowerby, pl. 22, figs. 1, 2 and explanation.
1900. *Cucullaea lasti* Müller : 533, pl. 17, figs. 1, 2.
1940. *Grammatodon* (*Indogrammatodon*) *virgatus* (J. de C. Sow.) ; Cox : 47, pl. 2, figs. 22–30.

Material. Several specimens, *ex* B.P. Coll., those presented to the Museum bearing the numbers LL.35089–90.

Localities and horizons. ½ mile N.W. of bridge over Mkulumuzi river, 2 miles W. of Tanga, Tanganyika ; Callovian. Lonji creek, W. of Mandawa, Tanganyika ; Callovian(?). Along Lihimaliao stream at a point about ¾ mile E. of Njenja, Tanganyika ; Upper Oxfordian(?).

Remarks. These specimens agree, on the one hand, with "*Cucullaea*" *lasti*, originally described from Callovian beds at a locality west of the Mahokondo creek, N.W. of Kiswere, Tanganyika, and, on the other hand, with specimens of "*Cucullaea*" *virgata* from its type-area, Cutch. The number of ribs on the left valve, omitting a few weak ones, some intercalated between the main ones, others occupying the posterior area, varies from about 17–24 ; the number on the right valve is considerably larger and at the same time even more variable.

Grammatodon (Indogrammatodon) stockleyi Cox

Pl. 2, fig. 9

1937*a*. *G.* (*I.*) *stockleyi* Cox : 197, 200, pl. 16, fig. 1.
1960. *G.* (*I.*) *stockleyi* Cox ; Joubert, pl. 6, figs. 8*a*, *b*.

MATERIAL. The holotype (no. L.54109), described previously, and several paratypes and later collected specimens.

LOCALITIES AND HORIZONS. S. of Tarawanda, 11 miles S.E. of Lugoba, Tanganyika ; Callovian. Scarp face, eastern margin of Makoko plain, Bagamoyo hinterland, Tanganyika ; Oxfordian. Wilderri hill, 11 miles S.S.W. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones.

REMARKS. The largest specimens are 90 mm. long. Among representatives of *Indogrammatodon* this species is exceeded in size only by *G.* (*I.*) *iddurghurensis* Cox, from the Argovian of India. The number of main ribs on the left valve may be as few as 11, but is usually about 15.

Grammatodon* (*Indogrammatodon*) *irritans (Hennig)

Pl. 2, fig. 3

1914*b*. *Cucullaea irritans* Hennig : 175, pl. 14, fig. 6.
1933. *Cucullaea irritans* Hennig ; Dietrich : 26, pl. 2, figs. 23–32.
1960. *Grammatodon* (*Indogrammatodon*) *irritans* (Hennig) ; Joubert, pl. 6, fig. 7.

MATERIAL. Numerous specimens.

LOCALITIES AND HORIZONS. Tendaguru neighbourhood (1 mile N.W. of Tendaguru hill, Kindope, and Kipande path), Tanganyika ; Upper Kimmeridgian, *Nerinella* and "*Trigonia smeei*" Beds. Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Indogrammatodon* Bed. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya ; Kimmeridgian, Hereri Shales.

REMARKS. Compared with *G.* (*I.*) *virgatus*, this species is smaller, less elongate, more strongly inflated, and more sharply carinate posteriorly, with a more pronouncedly concave posterior area. The largest specimens examined are about 35 mm. long. The number of ribs anterior to the carina on the left valve is usually about 15, but there may be one or two fewer. In some specimens the number on the right valve is about the same, but in others it is considerably greater. In some right valves the ribbing is only feebly developed near the posterior carina.

Grammatodon* (*Indogrammatodon*) *matapwaensis sp. nov.

Pl. 2, figs. 6*a*, *b*

DIAGNOSIS. Small (length of larger specimen 17 mm.), rectangularly ovate, subequilateral, not much elongated, well inflated, most so anteriorly to mid-length. Umbo almost median, projecting to a moderate extent above hinge-margin. Posterior area feebly concave, the boundary between it and the flank rounded off, not forming a distinct carina. Flank and area ornamented with well separated, unevenly spaced radial threads, with densely and regularly arranged concentric threads overriding them and occupying their intervals ; the radial threads are slightly the more closely arranged on the right valve, where one or (rarely) two weaker intercalary threads may occupy the main intervals ; the total number anterior to the carina on the left valve is uncertain, but must have exceeded 20.

HOLOTYPE AND PARATYPE. Nos. LL.35091, LL.35092 respectively, both *ex* B.P. Coll.

LOCALITY AND HORIZON. N. of Matapwa, Pindiro area, Tanganyika ; Upper Kimmeridgian.

REMARKS. This species is more nearly equilateral than *G.* (*I.*) *irritans* and has a blunter boundary between its flank and posterior area and more numerous ribs. The delicate concentric threads which form part of its ornament have not been observed in *G.* (*I.*) *irritans*.

Genus ***APOLINTER*** Casey 1961

Apolinter kindopeensis sp. nov.

Pl. 3, figs. 3*a*, *b*, 4*a*, *b*

DIAGNOSIS. Small, with the length (16 mm. in the larger specimen, the holotype) slightly less than twice the height ; convexity moderate. Ventral margin evenly convex, its general direction diverging from the hinge-margin in a posterior direction, so that the shell is highest near its posterior end. Umbo broadly rounded, placed at about anterior third of length of shell, protruding slightly above the hinge-margin. A well-defined umbonal ridge, curved with an upward-facing convexity, runs to the postero-ventral corner of the shell and delimits a narrow, concave posterior area. Hinge-margin about three-quarters of length of shell ; postero-dorsal angle obtuse. It is evident that the ligamental area, although not seen in available specimens, was narrow, and that the umbones of the two valves were very little separated. Ornament of regular, close-spaced, depressed concentric ribs.

HOLOTYPE AND PARATYPE. Nos. L.56243, L.56244 respectively.

LOCALITY AND HORIZON. Kindope, 2 miles N.N.W. of Tendaguru, Tanganyika. Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. The specimens are casts preserved in sandstone and retain traces of the concentric ornament of the original shell, although not of any radial ornament that may have been present at its extremities. There is no evidence as to the arrangement of the hinge-teeth. The species is referred to *Apolinter* on account of its very close resemblance to the type-species of that genus, *Arca aptiensis* Pictet & Campiche, as figured by Woods (1899 : 35, pl. 6, figs. 8, 9). The dentition of *Apolinter*, figured by Casey (1961 : 589, fig. 11*a*) is of the general type characteristic of the genera *Parallelodon* and *Grammatodon*.

No very closely comparable described Jurassic species can be cited. In the Lower Volgian species " *Cucullaea* " *schourovskii* Rouillier, referred to *Macrodon* by

Borissiak (1905 : 12, pl. 2, figs. 10–14), the ventral margin is usually parallel with the hinge-margin, although in Borissiak's " var. a " (fig. 13) there is a slight tendency for them to diverge posteriorly. In the Callovian species " *Cucullaea* " *rouilleri* Trautschold, referred to *Macrodon* by Borissiak (1905 : 8, pl. 2, figs. 1–4) and to *Beushausenia* by Cossmann (1923 : 15, pl. 6, figs. 14–17), the two margins are as strongly divergent as in the new species, but the shell is more inequilateral and distinctly irregular in form, some specimens having a broad, shallow sinus of the ventral margin.

Family **CUCULLAEIDAE** Stewart 1930

Genus ***CUCULLAEA*** Lamarck 1801

Cucullaea kipandeensis sp. nov.

Pl. 3, figs. 1*a*, *b*

Diagnosis. Of medium size, with the length (48·5 mm. in the holotype) well exceeding the height (38 mm.), strongly inflated, most so anterior to mid-length, tapering slightly in a posterior direction, with posterior half of ventral margin flattened or very feebly concave. Umbonal region very broadly rounded and prominent, the summit just anterior to mid-length. Posterior carina well marked although rounded off, with a slight sigmoidal curvature, and delimiting a concave posterior area which is just visible in the side view of the shell. Anterior two-thirds of flank ornamented with strong, narrow, widely and irregularly spaced radial ribs, which on its posterior third are replaced by closely spaced, weak riblets crossed by concentric threads ; posterior area with a few faint radial threads. A few coarse concentric corrugations mark the later growth-stages of the shell.

Holotype and paratypes. Holotype, no. L.53146. There are two paratypes, both ill-preserved.

Locality and horizon. Kipande, W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

Remarks. The posterior part of the hinge is not clearly exposed and it is uncertain if the species is correctly included in *Cucullaea*. It is not so elongate as typical species of *Parallelodon*, while its better defined posterior area and its posterior taper distinguish it from *Indogrammatodon*. This species recalls a Toarcian shell figured by Cossmann (1915*a* : 16, pl. 6, figs. 6–8) under the name *Parallelodon guibali*, but its radial ornament is stronger than in Cossmann's shell and it is less inequilateral. There is also a general similarity to *Cucullaea elegans* Roemer (1836 : 103, pl. 6, figs. 16*a*, *b*), also from the Upper Lias, and it is to be suspected that Cossmann's specimen should have been referred to Roemer's species. Imperfect specimens from Tendaguru figured by Dietrich (1933 : 27, pl. 2, figs. 33–35) as a *Cucullaea* of the group of *C. contracta* (Phillips) may have belonged to the present species, but the radial ribs indicated in that author's illustrations are indistinct, perhaps owing to the eroded condition of the specimens.

Family **ARCIDAE**

Genus ***EONAVICULA*** Arkell 1929

Eonavicula sp. " A "

Pl. 2, figs. 8*a*, *b*

Material. One specimen (no. L.92046).

Locality and horizon. Muddo Erri, 12 miles W. of Rahmu, N.E. Kenya ; Callovian [?–Lower Oxfordian], Muddo Erri Limestones.

Description. This specimen is 31·5 mm. long, well elongated and strongly inequilateral, with the umbo at about the anterior quarter of the length. The symmetrically arched ventral margin is almost flat in the middle ; the growth-lines show that it had a shallow median sinus at an earlier stage of growth. The well-marked posterior carina has a gentle upward-facing concavity and borders a posterior area on which the internal mould has one conspicuous radial sulcus and traces of at least one other above it. Although mainly an internal mould, the specimen retains a few portions of the original shell on which well-marked growth-rugae are crossed by fine radial threads.

Remarks. This specimen, which has the general appearance of an *Eonavicula* although its hinge-structure is not seen, is more strongly inequilateral than the Bathonian species *E. minuta* (J. de C. Sowerby), the best figure of which, published by Morris & Lycett (1853, pl. 5, fig. 17), is misidentified as *Arca aemula*. The Oxfordian (Corallian) species *E. quadrisulcata* (J. de C. Sowerby) (Arkell, 1929*a*, pl. 1, figs. 3–5) is less elongate and inequilateral, and has four sulci on its posterior area. The Kimmeridgian species *E. fracta* (Goldfuss) (1837 : 141, pl. 121, figs. 10*a*, *b*) is as elongate as the present specimen but is not quite so strongly inequilateral, while, according to Goldfuss's figure, its posterior area is without sulci. The specimen now described may thus belong to a new species, but it seems undesirable to assign a name to it as it retains so little of its shell.

Eonavicula sp. " B "

Pl. 3, fig. 2

Material. One specimen (no. LL.11517).

Locality and horizon. Kindope, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

Description. This specimen, an internal mould, is 22·5 mm. long, well elongated, and moderately inequilateral, with the umbo at about the anterior third of the length. The whole of the posterior half of the ventral margin forms a broad sinus. The well-marked posterior carina has a gentle upward-facing concavity, and above it are two radial sulci.

Remarks. This specimen differs from the equally elongate *Eonavicula* sp. " A " in the more anterior position of its umbo and in the broad sinus of the posterior part of the ventral margin. It is much more elongate than a specimen from Tendaguru recorded by Dietrich (1933 : 26, pl. 2, fig. 36) as *Arca* (*Eonavicula*) cf. *quadrisulcata* (Sow.). *E. fracta* (Goldfuss) (1837 : 141, pl. 121, figs. 10*a*, *b*), from the Kimmeridgian of Germany, is similarly elongate, but the broad sinus of its ventral margin occupies a more anterior position.

Superfamily **MYTILACEA**

Family **MYTILIDAE** Rafinesque 1815

Genus ***LITHOPHAGA*** Röding 1797

Lithophaga suboblonga Dietrich

1933. *Lithophaga suboblonga* Dietrich : 73, pl. 7, figs. 94, 95.

Material. Numerous crypts preserved in limestone.

Localities and horizons. Kipande creek, Lilomba creek, Tingutitinguti creek, and N.E. of Nguruwe, all near Tendaguru, Tanganyika ; Upper Kimmeridgian, "*Trigonia smeei*" Bed. Kindope, 2 miles N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

Genus ***MODIOLUS*** Lamarck 1799

Modiolus imbricatus (J. Sowerby)

Pl. 3, figs. 5, 6

1818*a*. *Modiola imbricata* J. Sowerby : 21, pl. 212, figs. 1, 3.
1935*a*. *Mytilus* (*Modiolus*) *imbricatus* (J. Sowerby) ; Cox : 162, pl. 16, figs. 3–5.

Material. About four specimens.

Localities and horizons. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika ; Bajocian (?), Pindiro Shales. Tifo, 14 miles N. of Wergudud, and Korkai Hammassa, 19 miles E. of Takabba, both N.E. Kenya ; Oxfordian, Golberobe Beds.

Remarks. Although from two well separated horizons, all the specimens now recorded seem indistinguishable from the typical *M. imbricatus*. The range of this species in Europe is generally accepted as from Bajocian to Callovian, and closely comparable forms found in the Oxfordian and Kimmeridgian have usually been identified as *M. aequiplicatus* (Strombeck) (*M. subaequiplicatus* (Roemer)). The view that such forms are specifically inseparable from *M. imbricatus* was adopted by me in 1935 when recording specimens from both the Callovian and the Oxfordian of British Somaliland, and I am still convinced of its correctness.

Modiolus anatinus (Smith)

Pl. 3, fig. 7

1817. *Modiola anatina* Smith : 89.
1818*a*. *Modiola cuneata* J. Sowerby : 19, pl. 211, fig. 1.
1818*a*. *Modiola gibbosa* J. Sowerby : 19, pl. 211, fig. 2.
1818*a*. *Modiola reniformis* J. Sowerby : 20, pl. 211, fig. 3.

MATERIAL. About ten specimens.

LOCALITY AND HORIZON. Kidugallo Station and 1¼ miles to the east, Central Railway, Tanganyika ; Bajocian, Station Beds.

REMARKS. The type-specimens of the above-cited species described by J. Sowerby, which are in the British Museum (Natural History), are all from the Fuller's Earth (Bathonian), although Sowerby wrongly stated that those of *M. cuneata* and *M. reniformis* were from the Inferior Oolite. They all belong to the same species, which Smith (1817) had described as *M. anatina*. In Europe it is widespread in the Bajocian and Bathonian and has been recorded from the Callovian.

This species differs from *M. imbricatus* in its greater inflation, its shorter form and more distinctly cuneiform outline, and shorter and more bulging antero-ventral lobe, which is separated from the flank by a furrow which tends to become accentuated when specimens, like those now recorded, have been partly flattened by pressure.

Modiolus bipartitus (J. Sowerby)

Pl. 3, fig. 9

1818*a*. *Modiola bipartita* J. Sowerby : 17, pl. 210, figs. 3, 4.
1929*a*. *Modiola bipartita* J. Sowerby ; Arkell : 55, pl. 2, figs. 1–4.
1948. *Modiolus bipartitus* J. Sowerby ; Cox & Arkell ; 4.

MATERIAL. Two specimens (nos. L.52087, LL.35093), the latter *ex* B.P. Coll.

LOCALITIES AND HORIZONS. ½ mile N.W. of bridge over Mkulumuzi river, 2 miles W. of Tanga, Tanganyika ; Callovian. Tingutitinguti creek, Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

REMARKS. These specimens have a shorter hinge-margin, a less pronounced postero-dorsal angle, and a more convex antero-ventral lobe than those referred to *M. imbricatus*. They are smaller than the holotype of *M. bipartitus* and the other English specimens figured by Arkell, but agree with them in shape. The affinities of a specimen from Tendaguru recorded by Dietrich (1933 : 72, pl. 2, fig. 42) as " *Modiola* sp., Gruppe der *M. bipartita* " are less certain. The range of the species in England is Upper Bathonian (Lower Cornbrash) to Kimmeridgian, but it is rare above the Oxfordian.

Modiolus virgulinus (Thurmann & Étallon)

Pl. 3, fig. 8

1862. *Mytilus virgulinus* Thurmann & Étallon : 224, pl. 29, fig. 6.
1875. *Mytilus virgulinus* Étallon ; de Loriol : 152, pl. 18, figs. 17, 18.
1960. *Modiolus virgulinus* (Étallon) ; Joubert, pl. 6, figs. 12*a*, *b*.

Material. One specimen (no. L.92181).

Locality and horizon. 3 miles N.E. of Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

Remarks. This specimen agrees very closely in shape with de Loriol's fig. 18, cited above. It is, however, rather eroded near the dorsal margin and so does not show the strong growth-rugae which are confined to this region in typical specimens of the species. *M. virgulinus*, as its name suggests, occurs in France in the " Virgulian " stage of the Kimmeridgian.

Subgenus ***INOPERNA*** Conrad 1875

Modiolus (Inoperna) sowerbianus (d'Orbigny)

Pl. 3, figs. 10, 11

1819*a*. *Modiola plicata* J. Sowerby : 87, pl. 248, fig. 1 (*non Mytilus plicatus* Gmelin 1791).
1850*a*. *Mitylus* [*sic*] *sowerbianus* d'Orbigny : 282.
1910. *Modiola plicata* Sow. ; Dacqué : 30, pl. 5, fig. 10.
1940. *Modiolus* (*Inoperna*) *plicatus* J. Sowerby ; Cox : 71, pl. 5, figs. 13, 14.

Material. Two fragments from the Toarcian ; several specimens from higher beds.

Localities and horizons. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds. Korkai Hammassa, 19 miles E. of Takabba, N.E. Kenya, and Tifo, 14 miles N. of Wergudud, N.E. Kenya ; Oxfordian, Golberobe Beds.

Remarks. In this species each of the strong oblique ribs which meet the dorsal margin of the shell splits up half-way to the diagonal carina into from three to several weak ribs, or is replaced by them without distinctly splitting up. This feature of the ribbing is observable in the Toarcian specimens now recorded and in the best preserved one from higher beds.

D'Orbigny's replacement name is here adopted for the species in consequence of the Article 59(b) of the International Code, whereby secondary homonymy produced prior to 1961 (in this case by d'Orbigny's transference of Sowerby's species to *Mytilus*) requires a permanent change of the specific name.

Modiolus* (*Inoperna*) *perplicatus (Étallon)

Pl. 3, fig. 14

1862. *Mytilus perplicatus* Étallon, *in* Thurmann & Étallon : 223, pl. 29, fig. 8.
1913. *Modiola* (*Pharomytilus*) *perplicata* (Étallon) ; Dietrich : 73.
1914*b*. *Modiola perplicata* (Étallon) ; Hennig : 176, pl. 14, fig. 4.
1960. *Modiolus* (*Inoperna*) *perplicatus* (Étallon) ; Joubert, pl. 6, figs. 13*a*, *b*.

MATERIAL. Six specimens.

LOCALITIES AND HORIZONS. 3 miles N.E. of Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones. Tendaguru, Tanganyika ; Upper Kimmeridgian. Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Indogrammatodon* Bed.

REMARKS. This species differs from *M.* (*I.*) *sowerbianus* in that each of the oblique ribs meeting the dorsal margin bifurcates half-way to the diagonal carina and is thus replaced by exactly two weaker ribs. In Europe this form occurs only in the Kimmeridgian.

Genus ***MUSCULUS*** Röding 1797

Musculus kindopeensis sp. nov.

Pl. 4, figs. 1*a*, *b*

DIAGNOSIS. Small (length of holotype 9·3 mm.), moderately elongate, with the length, measured parallel to the hinge-margin, rather less than twice the height, not greatly oblique, ornamented, as in typical *Musculus*, with radial threads which are absent from the concave area separating the antero-ventral lobe from the most inflated part of the shell, which runs diagonally from the beak to the postero-ventral corner. The threads of the posterior series number about 36 where they meet the margin; those of the anterior series about 12.

HOLOTYPE AND PARATYPES. Holotype, no. LL.11331. Six paratypes, nos. L.56234, LL.11328–30, LL.11332, LL.11516.

LOCALITY AND HORIZON. Scarp at Kindope, 2 miles N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. This form is less elongate and smaller than the European Kimmeridgian-Portlandian species *M. autissiodorensis* (Cotteau) (de Loriol 1868 : 625, pl. 12, fig. 8 ; 1875 : 152, pl. 18, fig. 14).

Genus ***MYTILUS*** Linnaeus 1758

Subgenus ***FALCIMYTILUS*** Cox 1937

Mytilus* (*Falcimytilus*) *tifoensis sp. nov.

Pl. 3, figs. 12, 13

1957. *Lycettia dalpiazi* Venzo ; Saggerson & Miller : 14.

DIAGNOSIS. Of medium size (diagonal measurement from beak to postero-ventral corner 39 mm. in the holotype), markedly falciform, oblique (the diagonal forming an angle of about 45° with the hinge-margin), variable in breadth, moderately inflated ; dorsal margin not much elongated, meeting the convex posterior margin in a broad curve. A very sharp ridge, strongly curved and forming almost a quadrant, runs from the beak to the ventral extremity and separates the flank from a narrow antero-ventral region which slopes steeply to the margin and protrudes beyond the ridge, so as to be visible in the side-view of the shell only near the beak. Surface ornament unknown, the specimens being internal moulds.

Holotype and paratypes. Holotype, no L.93615. Three paratypes, nos. L.93581, L.93616–17.

Localities and horizon. Tifo, 14 miles N. of Wergudud, and Ogar Wein hills, 17 miles N.W. of Wergudud, N.E. Kenya ; Oxfordian, Golberobe Beds.

Remarks. The specimens upon which this species is founded were originally recorded (Saggerson & Miller 1957 : 14) as *Lycettia dalpiazi* Venzo. On careful examination, however, they prove to belong to a species of *Falcimytilus* in which the diagonal ridge is unusually sharp, as they differ from *Lycettia* in the distinct protrusion of the anterior margin beyond the ridge. *Mytilus* (*Falcimytilus*) *suprajurensis* Cox (1925 : 142, pl. 1, fig. 9 ; pl. 3, fig. 2 ; 1937*c* : 344, pl. 17, figs. 1–3), from the Kimmeridgian and Portlandian of England, is a closely related but rather larger species.

Mytilus* (*Falcimytilus*) *jurensis Roemer

1836. *Mytilus jurensis* [*ex* Merian MS.] Roemer : 89, pl. 4, fig. 10.
1935*a*. *Mytilus jurensis* Roemer ; Cox : 161, pl. 15, figs. 15–17.

Material. Six specimens.

Localities and horizons. Romicho, 25 miles S.W. of El Wak, N.E. Kenya ; beds just underlying Golberobe Beds (Oxfordian). 2½ miles S.W. of Rahmu, N.E. Kenya ; Oxfordian, Rahmu Shales. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya ; Kimmeridgian, Hereri Shales.

Remarks. Like those from Somaliland figured in the work cited (Cox 1935*a*), these specimens vary considerably in obliquity and in the development of an anteroventral bulge, which gives some of them a modioliform outline.

Mytilus* (*Falcimytilus*) *dietrichi sp. nov.

Pl. 3, figs. 15, 16

1914*b*. *Mytilus* cf. *galliennei* d'Orbigny ; Hennig : 157, pl. 14, figs. 3*a*, *b*.
1933. *Mytilus* sp. ; Dietrich : 72.

Diagnosis. Of medium size (diagonal measurement from beak to postero-ventral corner 33 mm. in holotype), oblique (the diagonal forming an angle of about 45° with the hinge-margin), variable in breadth, moderately inflated ; dorsal margin not much elongated, meeting the convex posterior margin in a broad curve. A blunt and scarcely curved ridge runs from the beak to the ventral margin and separates the flank from a narrow antero-ventral region, the margin of which presents only a slight concavity below the beak and does not project anteriorly to it. Surface unornamented.

Holotype and paratypes. Holotype, no. L.52187 ; numerous paratypes.

Localities and horizons. Dirahara, 24 miles E.N.E. of Aus Mandula, N.E. Kenya, and Tifo, 14 miles N. of Wergudud, N.E. Kenya ; Oxfordian, Golberobe Beds. Tendaguru neighbourhood (Kindope valley, Tingutitinguti creek, Lilomba creek), and Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru, Tanganyika ; all Upper Kimmeridgian, " *Trigonia smeei* " Bed.

Remarks. *Mytilus galliennei* d'Orbigny, the Cenomanian species from France to which this form was originally compared by Hennig, has a less marked diagonal ridge, lacks any convexity of the anterior margin below the beak, and has weak transverse striations on its antero-ventral region.

Genus ***BRACHIDONTES*** Swainson 1840

Subgenus ***ARCOMYTILUS*** Agassiz 1842

Brachidontes (Arcomytilus) asper (J. Sowerby)

Pl. 4, figs. 2*a*, *b*

1818*a*. *Modiola aspera* J. Sowerby : 22, pl. 212, fig. 4.
1948. *Brachidontes* (*Acromytilus*) *asper* (J. Sowerby) ; Cox & Arkell : 5.
1960. *Brachidontes* (*Arcomytilus*) *asper* (J. Sowerby) ; Joubert, pl. 6, figs. 10*a*–*c*.

Material. Two specimens (nos. L.92067, L.92177).

Localities and horizons. 2 miles W. of Melka Biini, N.E. Kenya ; Bathonian, Murri Limestones. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Remarks. The specimens now recorded are typical examples of this species, which in England appears to be restricted to the Bathonian, but is known from the Callovian of various other areas.

Brachidontes (Arcomytilus) laitmairensis (de Loriol)

Pl. 4, fig. 3

1883. *Mytilus laitmairensis* de Loriol : 57, pl. 8, figs. 6–12.
1935*a*. *Mytilus* (*Arcomytilus*) *laitmairensis* de Loriol ; Cox : 164, pl. 15, figs. 13, 14.
1960. *Mytilus* (*Arcomytilus*) sp. ; Joubert, pl. 6, fig. 9.

Material. Four specimens.

Localities and horizons. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones. Tifo, 14 miles N. of Wergudud, N.E. Kenya ; Oxfordian, Golberobe Beds. N. of Matapwa, Pindiro area, Tanganyika ; Upper Kimmeridgian.

Remarks. The differences between this species and *B.* (*A.*) *subpectinatus* (d'Orbigny) (= *pectinatus* (J. Sowerby)) were discussed by me in the work cited above. The specimens now recorded, including those from the Kimmeridgian, agree with *B.* (*A.*) *laitmairensis* in their rounded postero-ventral margin and in the absence of a definite ridge running from the umbo to the posterior end of this margin. This species occurs most commonly in the Callovian, but Arkell has recorded its occurrence in the English Oxfordian. It has not been recorded previously from the Kimmeridgian. The true *B.* (*A.*) *subpectinatus* has been recorded from Tendaguru by Dietrich (1933 : 72, pl. 2, fig. 47), but is not represented in the collections from that locality in the British Museum (Natural History).

Superfamily **PTERIACEA**

Family **PTERIIDAE** Gray 1847

Genus ***PTERIA*** Scopoli 1777

Pteria tanganyicensis sp. nov.

Pl. 4, fig. 4

Diagnosis. Large (original length at least 9 cm.), well inflated, obliquely elongate, with a rather narrow body which has a slight sigmoidal curvature. Anterior wing large, acute, not compressed ; posterior wing more compressed and differentiated from the body than the anterior one, appearing (from its earlier growth lines) to have had an acutely pointed tip (it is broken away distally in the holotype). Surface of shell without radial ornament.

Holotype. No. LL.16793, a right valve damaged posteriorly. The only specimen.

Locality and horizon. Usigiwa river, 6 miles W.S.W. of Kiwangwa, Bagamoyo hinterland, Tanganyika ; Upper Oxfordian.

Remarks. The cardinal area is not seen in the holotype, so that the number of ligamental pits cannot be ascertained, but the species is referred to *Pteria* as its general form is more suggestive of that genus than of any representatives of the family Bakevelliidae. In size and shape it much resembles *Avicula struckmanni* de Loriol (1875 : 164, pl. 20, fig. 1), from the Kimmeridgian of France, but it differs in the much larger size of its anterior auricle. No comparable form has been recorded previously from East Africa.

Family **BAKEVELLIIDAE** King 1850

Genus ***BAKEVELLIA*** King 1848

Bakevellia iraonensis (Newton)

1895. *Gervillia iraonensis* Newton : 80, pl. 2, figs. 8, 9.

Material. Four specimens (nos. LL.7224–27).

Locality and horizon. Quarries N.N.E. of Ngerengere, Central Railway, Tanganyika ; Bajocian (?).

REMARKS. Although ill-preserved, these specimens can be seen to have the strong inflation and the general outline of Newton's species, the holotype of which, from the Bathonian of Madagascar, is in the British Museum (Natural History). Hennig (1914*a* : 65 ; 1924 : 31) has already recorded the presence of a form identified as *Gervillia* aff. *iraonensis* in Tanganyika.

Genus ***GERVILLELLA*** Waagen 1907

Gervillella didimtuensis sp. nov.

Pl. 4, figs. 5*a*, *b*, 6

DIAGNOSIS. Of medium size (measuring up to 50 mm. from anterior end of hinge-line to extremity of body), moderately inflated, trapezoidal, oblique ; shell-wall very thick. Anterior and ventral margins forming a strongly convex, uninterrupted curve. Body of shell broad, evenly inflated, its level descending gradually to the anterior margin and to the posterior wing. Length of hinge-margin about four-fifths of that of shell ; posterior wing obtusely angular, apparently not acutely pointed at its tip in any stage of growth. Anterior auricle absent ; beak terminal in most specimens, but in some the anterior margin projects very slightly beyond it. Umbo projecting only very slightly above hinge-margin. Ligamental pits four or fewer, extending from beak along about two-thirds of hinge-margin. A rather long, oblique, ridge-like tooth, inclined at an angle of about 45° with the hinge-margin, originates just below the beak ; posterior to it are several small, similarly oblique teeth, and near the posterior end of the hinge-margin and diverging only slightly from it is a strong, elongate tooth.

HOLOTYPE AND PARATYPES. Nos. LL.35012 and LL.35013–16 respectively, five specimens in all.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. The absence of an anterior auricle readily distinguishes this species from the Bajocian form, *Gervillella orientalis*, described next.

Gervillella orientalis (Douvillé)

Pl. 4, figs. 7*a*, *b*, 8

1916. *Gervillia orientalis* Douvillé : 59, pl. 4, figs. 14–17.

MATERIAL. Several specimens ; *ex* B.P. Coll.

LOCALITIES AND HORIZON. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika ; near site of Mandawa well no. 1, Tanganyika ; depth 50–52 feet in Mandawa well no. 6, Tanganyika ; all Bajocian (?), Pindiro Shales.

DESCRIPTION. The shell is of medium size (measuring up to 40 mm. from tip of anterior auricle to extremity of body), subequivalve, oblique. The length of the hinge-margin is about three-fifths of that of the shell. When not broken away, an acute anterior auricle extends well beyond the umbo, which projects only slightly above the hinge-margin. The anterior and ventral margins form a strongly convex, uninterrupted curve. The body of the shell, which varies considerably in breadth and obliquity, is evenly and moderately inflated, its level descending gradually to the anterior margin and to the posterior wing. The growth-lines show that the posterior wing, which is obtusely triangular in general shape, was acutely pointed at its extremity in earlier growth-stages. In the material examined some shell fragments show traces of hinge-teeth, but the complete dentition is not displayed.

REMARKS. This species was based on several broken specimens from Jebel Aroussieh, Sinai. Douvillé queried their age as Callovian, but a specimen collected more recently is from beds which are undoubtedly Bathonian in age. Douvillé's figures indicate a range of variation similar to that shown by the specimens now described, and justify the inclusion of all of these in the same species. The present specimens, however, lack the radial sulcus of the body of the shell observable in specimens from Sinai. The less expanded specimens of the species rather resemble *Gervillella ovata* (Morris & Lycett), an English Bathonian form, differing mainly in the presence of the pointed anterior auricle. *G. iraonensis* (Newton), Bathonian of Madagascar, is a more gibbose shell with a broad sinus of the anterior margin.

Gervillella siliqua (Eudes-Deslongchamps)

Pl. 4, fig. 10

1824. *Gervillia siliqua* Eudes-Deslongchamps : 128, pl. 4.
1940. *Gervillella siliqua* (Eudes-Deslongchamps) ; Cox : 112, pl. 7, figs. 12–14.

MATERIAL. One specimen (no. L.92032).

LOCALITY AND HORIZON. Tifo, 14 miles N. of Wergudud, N.E. Kenya ; Oxfordian, Golberobe Beds.

REMARKS. The specimen now recorded, which is about 45 mm. long, closely resembles one from the Oxfordian of Cutch, India, represented in fig. 13 of the work cited above. To the synonyms of *G. siliqua* there given should probably be added *Gervillia mayeri* Moesch (1867 : 308, pl. 5, figs. 10*a*, *b*).

Gervillella aviculoides (J. Sowerby)

1814*a*. *Perna aviculoides* J. Sowerby : 147, pl. 66, figs. 1–4.
1836. *Gervillia tetragona* Roemer : 85, pl. 4, fig. 11.
1875. *Gervillia tetragona* Roemer ; de Loriol : 165, pl. 19, figs. 3–5.
1933*a*. *Gervillia aviculoides* (J. Sowerby) ; Arkell : 203, pl. 26, figs. 1–5.
1933. *Gervilleia* (*Gervillella*) sp., *aviculoides*-Gruppe ; Dietrich : 60.

MATERIAL. Several imperfect specimens.

LOCALITIES AND HORIZONS. 1 mile N.W. of Tendaguru hill and scarp at Kindope, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed. Tingutitinguti creek, Tendaguru ; Upper Kimmeridgian, "*Trigonia smeei*" Bed. Just W. of Mabokweni, 4 miles N.W. of Tanga, Tanganyika ; Kimmeridgian.

Remarks. De Loriol and other authors have applied Roemer's name *Gervillia tetragona* to a species which occurs in the Kimmeridgian of France and other European countries. Comparison of French specimens of that age with typical English specimens of *G. aviculoides*, from the Corallian Beds (Oxfordian), has convinced me that all belong to the same species. The East African specimens now recorded cannot be distinguished from the European species.

Genus ***GERVILLIA*** Defrance 1820

Gervillia saggersoni sp. nov.

Pl. 4, fig. 11

Specific name. After Dr. E. P. Saggerson, of the Kenya Geological Survey.

Diagnosis. Of medium size (length of holotype 62·5 mm.), broadly falciform, not greatly oblique, diagonal from umbo forming an angle of about 15° with hinge-margin. Hinge-margin about one-half of length of shell ; umbo protruding only slightly and situated near anterior end of hinge-margin. Anterior and ventral margins forming an uninterrupted, strongly convex curve ; posterior extremity bluntly rounded. Body of shell, which attains a maximum width of about 17 mm. in the holotype, evenly convex ; posterior wing narrow, flattened but not well differentiated, with an obtuse outer angle.

Holotype. No. L.93622, consisting of internal and external moulds of a left valve. A second internal mould (no. L.93499) is too ill-preserved to rank as a paratype.

Localities and horizon. Korkai Hammassa, 19 miles E. of Takabba, N.E. Kenya (type-locality), and Ogar Wein, 17 miles N.W. of Wergudud, N.E. Kenya ; Oxfordian, Golberobe Beds.

Remarks. This form was originally recorded (Saggerson & Miller 1957 : 14) as *Gervillia* cf. *monotis* Eudes-Deslongchamps, but the true *G. monotis*, from the Bathonian of Europe, is a smaller form with a narrower body. The most closely comparable species is *Gervillia pancici* Radovanović (1900 : 64, pl. 1, figs. 4, 5), from the Lower Lias of Yugoslavia, but this appears to have a longer dorsal margin. In view of their falciform outline these forms seem better included in *Gervillia* than in *Gervillella*.

Family **PINNIDAE**

Genus ***PINNA*** Linnaeus 1758

Pinna buchii Koch & Dunker

Pl. 4, fig. 9

1837. *Pinna buchii* Koch & Dunker : 33, pl. 2, fig. 18.
1869. *Pinna buchii* K. & D. ; Brauns : 230.
1899. *Pinna buchii* K. & D. ; Greppin : 99, pl. 13, figs. 5, 6.

MATERIAL. One specimen (no. LL.35095).

LOCALITY AND HORIZON. Near site of Mandawa well no. 1, Tanganyika ; Bajocian (?), Pindiro Shales.

REMARKS. The specimen is a crushed right valve with a sub-median carina on the dorsal side of which are about 12 radial riblets ; the ventral side bears well-marked growth-folds but is devoid of radial ornament. In having its radial ornament confined to the dorsal half of the surface the specimen resembles the original figure of the species, which represents a specimen from the Inferior Oolite of Holtensen, northern Germany ; its riblets, however, are more numerous than in the German specimen. In the specimens from the Upper Bajocian of Switzerland figured by Greppin radial riblets are present also on the ventral side of the median carina.

Pinna mitis Phillips

1829. *Pinna mitis* Phillips : 137, pl. 5, fig. 7.
1883. *Pinna mitis* Phil. ; Lahusen : 27, pl. 2, fig. 12.
1910. *Pinna* sp. ; Dacqué : 29, pl. 5, fig. 4.
1924. *Pinna mitis* Ziet. ; Hennig : 71, pl. 2, fig. 7.
1934. *Pinna mitis* Phil. ; Stoll : 19, pl. 2, fig. 9.

MATERIAL. Several specimens.

LOCALITY AND HORIZON. 6¼ miles N.E. of Pande (village on Mkwaja–Mkata road) and 2¼ miles N. of Msangasi stream, N.E. Tanganyika ; Callovian.

REMARKS. The specimens, the largest of which were about 60 mm. long when complete, are preserved in a hard sandstone and, when an attempt is made to extract them, usually break in such a manner that part of the wall of the shell adheres to each counterpart. Sufficient of their ornament can, however, be seen to show that it agrees with that of *Pinna mitis*, already recognized by Hennig (1924) in the Callovian of Tanganyika.

Pinna constantini de Loriol

1875. *Pinna constantini* de Loriol : 161, pl. 19, fig. 2.
1897. *Pinna constantini* de Loriol ; Futterer : 596, pl. 20, figs. 5, 5*a*.
1933. *Pinna* cf. *constantini* de Loriol ; Dietrich : 60, pl. 8, figs. 131–134.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Valley and scarp at Kindope, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " and *Nerinella* Beds.

REMARKS. The specimens from East Africa agree so well with de Loriol's illustration of the type specimen from the " Portlandien moyen " of France, that there seems no need to qualify the identification. The number of ribs on the dorsal side of the median carina of each valve is 5–7, while the number below the carina increases during growth to 6 or more, the extreme ventral part of the surface bearing only growth-folds.

There is some doubt whether this form should be considered synonymous with *Pinna ornata* d'Orbigny, a French Kimmeridgian species, one of the syntypes of which has been figured by Cottreau (1932, pl. 66, fig. 15). The ribs below the median carina seem to be weaker in *P. ornata*, but the difference is not great and only relatively small specimens have so far been figured.

Genus ***STEGOCONCHA*** Böhm 1907

Stegoconcha gmuelleri (Krenkel)

Pl. 5, fig. 8

1910. *Pinna G. Mülleri* Krenkel : 203, pl. 21, fig. 5.
1933. *Stegoconcha solida* Böhm var. *tendagurensis* Dietrich : 61, pl. 9, figs. 138, 139.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. 1 mile N.W. of Tendaguru hill, Tanganyika, around Kipande, W. of Tendaguru, and Kindope, N.N.W. of Tendaguru ; all Upper Kimmeridgian, *Nerinella* Bed. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones.

Family **MALLEIDAE** Gray 1823

Genus ***ELIGMUS*** Eudes-Deslongchamps 1856

Eligmus rollandi Douvillé

Pl. 5, figs. 5, 6

1907*a*. *Heligmus rollandi* Douvillé : 105, pl. 15, figs. 1–3.
1929. *Heligmus rollandi* Douvillé ; Weir : 23, pl. 1, figs. 24–28.
1935*a*. *Eligmus rollandi* Douvillé ; Cox : 168, pl. 16, figs. 6–10.
1960. *Eligmus rollandi* Douvillé ; Joubert, pl. 8, fig. 11.

MATERIAL. Several specimens.

LOCALITIES AND HORIZON. Muddo Erri ; Kulong, 2 miles S.W. of Muddo Erri ; Muddo river bed 4 miles S.W. of Muddo Erri ; S. of Rahmu–Melka Murri road, 6 miles W. of Rahmu ; 14 miles W.S.W. of Rahmu ; all N.E. Kenya : Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Superfamily **PECTINACEA**

Family **OXYTOMIDAE** Ichikawa 1958

Genus ***OXYTOMA*** Meek 1864

Oxytoma inequivalvis (J. Sowerby)

Pl. 5, fig. 7

1819*a*. *Avicula inequivalvis* J. Sowerby : 78, pl. 244, figs. 2, 3.
1933. *Oxytoma inaequivalvis* var. *hennigi* Dietrich : 58, pl. 7, figs. 99–101.
1940. *Oxytoma inequivalve* (J. Sowerby) ; Cox : 98, pl. 6, figs. 9–12.

MATERIAL. Two specimens.

LOCALITIES AND HORIZONS. Chinamba, ¾ mile S. of Amboni quarries, Tanga, Tanganyika ; Callovian (?) (*ex* B.P. Coll.). Kindope valley, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

Genus ***MELEAGRINELLA*** Whitfield 1885

Meleagrinella echinata (Smith)

1817. *Avicula echinata* Smith : 67.
1940. *Echinotis echinata* (Smith) ; Cox : 92, pl. 6, figs. 2–7.
1948. *Meleagrinella echinata* (Smith) ; Cox & Arkell : 7.

MATERIAL. Two specimens.

LOCALITY AND HORIZON. S. of Tarawanda, 11 miles S.E. of Lugoba, Tanganyika ; Callovian.

REMARKS. The specimens now recorded are not well preserved, but the number of their ribs is the same as in typical specimens of *M. echinata* and considerably fewer than in the specimens recorded below as *M. radiata* ; the ribs, moreover, are more equal in strength than in *M. radiata*. Müller and Hennig have reported *M. echinata* from the " Dogger " of Tanganyika.

Meleagrinella radiata (Trautschold)

Pl. 5, figs. 1*a*, *b*, 2*a*, *b*, 3*a*, *b*, 4*a*, *b*

1860. *Aucella radiata* Trautschold : 343, pl. 6, figs. 7, 8.
1870. *Avicula* (*Monotis*) *tenuicostata* Greppin : 350, pl. 5, figs. 7*a*, *b* (*non Avicula tenuicostata* Roemer 1841).
1899. *Pseudomonotis tenuicostata* (Greppin) ; de Loriol : 169, pl. 10, fig. 36.
1900. *Pseudomonotis tenuicostata* (Greppin) ; de Loriol : 126, pl. 6, fig. 44.
1900. *Avicula lieberti* Müller : 542, pl. 19, figs. 14–17.
1910. *Avicula tschingira* Krenkel : 203, pl. 20, fig. 12.
1912. *Pseudomonotis radiata* (Trautschold) ; Sokolov : 108, pl. 2, figs. 11–13.
1914. *Pseudomonotis lorioli* Rollier : 312 (for *P. tenuicostata* de Loriol *non* Greppin sp.).
1914*b*. *Pseudomonotis tendagurensis* Hennig : 182.
1924. *Pseudomonotis epechinata* Hennig : 87.
1933. *Pseudomonotis tendagurensis* Hennig ; Dietrich : 57, pl. 8, figs. 107–117.
1938. *Pseudomonotis lieberti* (Müller) ; Weir : 45, pl. 3, fig. 5.

MATERIAL. Numerous specimens.

LOCALITIES AND HORIZONS. Korkai Hammassa, 19 miles E. of Takabba, Ogar Wein, 17 miles N.W. of Wergudud, and Chimpa, all N.E. Kenya ; Oxfordian, Golberobe Beds. Plantations N. of Dakatcha village, and also ¾ mile E. of Merikano, both in Malindi district, Coast Province, Kenya ; in loose boulders, respectively of hard sandstone and of limestone, of uncertain age. Usigiwa river, 6 miles W.S.W. of Kiwangwa, Bagamoyo hinterland, Tanganyika ; Upper Oxfordian. Kiwate–Mkange track, 5 miles S.S.E. of Mkange, Bagamoyo hinterland, Tanganyika ;

Oxfordian or Kimmeridgian. 17 miles S. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones. Several localities around Tendaguru, Tanganyika ; Upper Kimmeridgian, "*Trigonia smeei*" and *Nerinella* Beds. Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Indogrammatodon* Bed.

REMARKS. Hennig and Dietrich did not adopt Müller's specific name *lieberti*, the first to be applied to East African specimens of this species, when recording specimens from Tendaguru, because Müller's description and figures suggested that he was dealing with a form in which the shell was completely smooth. The material from this locality now studied, however, includes specimens which appear smooth either because their outer shell layer has disappeared or because they are merely internal moulds. It thus seems evident that Müller's types were specimens preserved in one of these ways. Hennig apparently overlooked Krenkel's description of *Avicula tschingira* when founding his species *Pseudomonotis tendagurensis*.

In specimens from the Tendaguru district the left valve is ornamented with numerous closely arranged, narrow, round-topped riblets of unequal strength, increasing by intercalation. Details vary considerably in different shells. On parts of the surface in many specimens the riblets alternate in strength or weaker ones alternate with pairs of stronger ones. On some specimens the stronger ribs bear obscure, evenly spaced, imbricating scales. Right valves are of feeble convexity and bear well separated radial riblets. It has seemed important to reach a decision as to the identity of the *Meleagrinella* which is the most abundant species found in the Golberobe Beds of northern Kenya, and has been figured by Saggerson & Miller (1957 : 19, figs. *b–d*). I am now convinced that it is not possible to draw any specific distinction between this form and the Tendaguru species, as specimens with closely similar ornament occur in both areas. Those now illustrated include one (figs. 3*a*,*b*) with particularly numerous and closely spaced ribs. In the Golberobe specimens the right valve is almost smooth, with faint radial ribbing appearing in its later growth-stages. The largest of these specimens are about 15 mm. long.

It is also necessary to discuss whether previous workers have been justified in asssuming that the Tendaguru species is distinct from any found in Europe. In *M. echinata*, a European form recorded above from Tanganyika, the left valve is more strongly inflated and the ribs are less numerous, stronger, and more uniform in strength. In *M. braamburiensis* (Phillips), which occurs in the European Callovian and Oxfordian and has been well figured by Douglas & Arkell (1932 : 163, pl. 12, figs. 5, 6), the ornament is very similar to that of the Tendaguru form, but specimens commonly attain a length of 25–30 mm., which much exceeds the usual size of the latter. The species described by Trautschold as *Aucella radiata* and discussed in 1912 by Sokolov (who has included *Avicula tenuicostata* Greppin in its synonymy) appears, however, to be indistinguishable from the East African form, as inspection of de Loriol's figures of *A. tenuicostata* will show. In Europe *M. radiata* occurs in the Lower Oxfordian, so that its recognition in the Golberobe Beds of Kenya is in keeping with the supposed Oxfordian age of these beds. In view of its occurrence at

Tendaguru also, it is clear that in East Africa it has a moderately extended geological range.

Family **POSIDONIIDAE**

Genus ***BOSITRA*** de Gregorio 1886

Bositra buchii (Roemer)

Pl. 6, fig. 1

1836. *Posidonia Buchii* Roemer : 81, pl. 4, fig. 8.
1851. *Posidonia ornati* Quenstedt : 517, pl. 42, fig. 16.
1852. *Posidonomya alpina* Gras : 11, 48, pl. 1, fig. 1.
1869. *Posidonomya Buchii* (Roemer) ; Brauns : 242.
1896. *Posidonomya Buchi* (Roemer) ; Stremoouchow : 391, pl. 10.
1924. *Posidonomya Buchii* (Roemer) ; Hennig : 43.
1928. *Posidonomya alpina* Gras ; Guillaume : 228, pl. 10, figs. 4–13.
1930. *Posidonia ornati* Quenstedt ; Weir : 83, pl. 10, figs. 14–21.
1938. *Posidonia ornati* Quenstedt ; Weir : 45, pl. 3, fig. 5.
1940. *Posidonia ornati* Quenstedt ; Cox : 103, pl. 7, figs. 10, 11.

MATERIAL. Numerous specimens.

LOCALITIES AND HORIZONS. Kidugallo Station, Central Railway, Tanganyika ; Bajocian, Station Beds. Boreholes 5 miles N. of Kidugallo and at Lugoba, Tanganyika ; Lower Bajocian (Aalenian) (*see* Arkell, 1956 : 330). About 2½ miles S.S.W. of Tengeni (village on Pangani river), N.E. Tanganyika ; horizon uncertain. Kaya Kauma, 8 miles W. of Kilifi, Kenya ; Upper Callovian, Miritini Shales.

REMARKS. Many authorities have recognized that *Posidonia buchii* was founded on an unusually elongate specimen of the species more commonly known as *P. ornati* Quenstedt or as *P. alpina* (Gras), and this view is here accepted, although in previous works I have used Quenstedt's name for the species. It has an exceptionally long geological range, extending from the Toarcian (in Argentina) to the Upper Callovian. The recent work of R. P. S. Jefferies has shown that there are good grounds for the generic separation of *P. buchii* and related Jurassic forms from the type-species of *Posidonia*, *P. becheri* Bronn of the Carboniferous, and the generic name *Bositra* has long been available for them.

Bositra somaliensis (Cox)

Pl. 6, fig. 2

1935*a*. *Posidonia somaliensis* Cox : 166, pl. 15, figs. 7, 8.

MATERIAL. One specimen (no. L.51207).

LOCALITY AND HORIZON. Kindope valley, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. This valve of a *Bositra*, which is about 20·5 mm. long and slightly less in height, seems referable to *B. somaliensis* in view of its size and known geological age. *B. bononiensis* (de Loriol) (1875 : 170, pl. 21, figs. 3–5), from the Kimmeridgian of France, is a much smaller form.

Family **AMUSIIDAE** Ridewood 1903

Genus ***ENTOLIUM*** Meek 1865

Entolium corneolum (Young & Bird)

1828. *Pecten corneolus* Young & Bird : 234, pl. 9, fig. 5.
1900. *Pecten demissus* Phillips ; Müller : 527, pl. 17, fig. 10.
1924. *Pecten demissus* Phillips ; Hennig : 14, pl. 2, figs. 1, 2.
1929. *Entolium solidum* (Roemer) ; Weir : 23, pl. 1, fig. 33.
1930*a*. *Entolium demissum* (Phillips) ; Arkell : 91, pl. 7, fig. 4 ; pl. 9, fig. 8.
1930. *Entolium demissum* (Phillips) ; Weir : 87, pl. 10, figs. 4, 9.
1933. *Pecten* (*Entolium*) *solidus* Roemer ; Dietrich : 65, pl. 8, figs. 118, 119.
1938. *Entolium demissum* (Phillips) ; Weir : 46, pl. 3, fig. 8.
1948. *Entolium corneolum* (Young & Bird) ; Cox & Arkell : 15.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones. Wilderri hill, 11 miles S.S.W. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones. Manyuli stream, just W. of Nautope, Mandawa–Mahokondo anticline, Tanganyika ; Callovian. Scarp face, E. margin of Makoko plain, Bagamoyo hinterland, Tanganyika ; Upper Oxfordian. Hillside overlooking Lake Mbuo, Pindiro area, Tanganyika ; Middle Kimmeridgian. Valley and scarp at Kindope, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* and " *Trigonia smeei* " Beds. Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Indogrammatodon* Bed.

REMARKS. Authors who have drawn a specific distinction between *Pecten solidus* Roemer and *P. demissus* Phillips have admitted that stratigraphical rather than morphological considerations have led them to do so. Mlle C. Dechaseaux (1936 : 61) has regarded them as synonymous. Arkell has shown that *Pecten corneolus* was the earliest name for the species commonly known as *Entolium demissum*.

Entolium briconense (Cossmann)

Pl. 6, fig. 6

1907. *Chlamys* (*Syncyclonema*) *briconensis* Cossmann : 108, pl. 3, figs. 14, 15.
1913*a*. *Chlamys* (*Syncyclonema*) *briconensis* Cossmann ; Cossmann : 3, pl. 1, fig. 20.
1917. *Chlamys* (*Syncyclonema*) *briconensis* Cossmann ; Couffon : 120, pl. 4, fig. 1.
1924. *Syncyclonema briconense* Cossmann ; Cossmann : 30, pl. 5, figs. 1, 2.

MATERIAL. Three imperfect specimens (two in B.P. Coll.).

LOCALITIES AND HORIZONS. Plantation 4½ miles N. of Dakatcha village, Coast Province, Kenya ; in loose boulder. 2½ miles N. of Msaka road junction, Bagamoyo district, Tanganyika ; Callovian.

REMARKS. The specimens referred to this species, which was previously known only from the Callovian of France, have a characteristic ornament of concentric lines arranged in pairs a constant distance apart. They agree particularly well with the shell figured by Cossmann (1913*a*), who considers each pair of lines to mark the bases of attachment of concentric lamellae which formed the ornament of the uneroded shell.

Entolium cingulatum (Goldfuss)

Pl. 6, fig. 5

1836. *Pecten cingulatus* Goldfuss : 74 (*partim*), pl. 99, figs. 3*a*, *b*(?).
1926. *Entolium cingulatum* (Goldfuss) ; Staesche : 93, pl. 4, figs. 3, 4.

MATERIAL. One valve (counterparts), no. LL.35202.

LOCALITY AND HORIZON. 5 miles N.E. of Tengeni (village on Pangani river), at S. end of divide separating western tributary from main Maweni valley ; Upper Jurassic.

REMARKS. This specimen, a valve about 30 mm. high, clearly shows the two internal laminae, diverging from the beak and forming very acute angles with the dorsal margins of the body of the shell, which are characteristic of this and certain related species. There has been some difference of opinion as to the exact species to which Goldfuss's name *cingulatus* should be applied. In his original description Goldfuss attributed the species to Phillips and gave a reference to a figure published by that author (1829, pl. 5, fig. 11), representing a specimen from the Oxford Clay of England. Phillips, however, had merely recorded his specimen as *Pecten* sp. and for that reason it had been given the name *Pecten phillipsii* by Thurmann (1833 : 32). Thus Goldfuss, not Phillips, was the author of the name *cingulatus*, and when describing the species he recorded it from localities belonging partly to the Lias and partly to the White Jura, without stating from which his figured specimens came. D'Orbigny (1850*a* : 238, 257) assigned the names *Pecten philenor* and *P. proeteus* to species found at different horizons of the Lias, in each case referring to Goldfuss's figures of *P. cingulatus*. Staesche has maintained that this action amounted to the restriction of Goldfuss's species to specimens from the White Jura, a doubtful conclusion, particularly in view of the fact that d'Orbigny did not adopt the name *cingulatus* for specimens from any horizon. The matter could be finally resolved only by the definite selection of one of Goldfuss's figured specimens as lectotype of *P. cingulatus*, if the specimens can be traced and their horizons are determinable. The name *cingulatus* is, however, now adopted in the sense advocated by Staesche, according to whom the species to which it is applied ranges throughout the White Jura in Germany. The Oxford Clay specimen figured by Phillips, holotype of *Pecten phillipsii* Thurmann, belonged to a species which is certainly distinct although not readily identified.

Family **PECTINIDAE** Rafinesque 1815

Genus ***EOPECTEN*** Douvillé 1897

Eopecten aubryi (Douvillé)

Pl. 6, figs. 3, 4

1886. *Pleuronectites aubryi* Douvillé : 228, pl. 12, fig. 3.
1929. *Velata inaequistriata* (Futterer) ; Weir : 25, pl. 1, fig 24 only. (*non* Futterer sp.).

1939. *Velata aubryi* (Douv.) ; Stefanini : 186, pl. 20, figs. 10, 11 ; pl. 21, fig. 1.
1952. *Eopecten aubryi* (Douv.) ; Cox : 31, pl. 3, figs. 8–10.
1960. *Eopecten aubryi* (Douv.) ; Joubert, pl. 8, figs. 1*a*, *b*.
1960. *Eopecten abjectus* (Phillips) ; Joubert, pl. 7, fig. 7 (*non* Phillips sp.).

MATERIAL. Several specimens, one *ex* B.P. Coll.

LOCALITIES AND HORIZONS. 3½ miles W. of Melka Biini, N.E. Kenya ; Callovian, Rukesa Shales. Muddo Erri, 12 miles W. of Rahmu, N.E. Kenya, Kulong, 2 miles to the S.W., and S. of Rahmu–Melka Murri road, 6 miles W. of Rahmu ; all Callovian [?-Lower Oxfordian], Muddo Erri Limestones. Manyuli stream, just W. of Nautope, Mandawa–Mahokondo anticline, Tanganyika ; Callovian. Mandawa–Lonji creek traverse, Mandawa area, Tanganyika ; Upper Oxfordian.

REMARKS. Specimens from N.E. Kenya are mostly quite typical of this species, as described in the works cited above, although the one figured under the name *E. abjectus* by Joubert (1960) has very unevenly spaced ribs. Those from the Upper Oxfordian of Tanganyika, while agreeing with the typical *E. aubryi* in the number, equality, and fairly regular distribution of the main radial ribs, differ in the almost complete smoothness of the intervals, which bear at the most a faint median riblet, finer interstitial threads being absent. There are insufficient grounds at present for distinguishing them even as a new sub-species, although they seem to be of rather later age than the hitherto recorded range (Bathonian–Lower Oxfordian) of *E. aubryi*. There are three specimens of the right valve of this species in the material studied, and their ornament consists of numerous fine, subequal, weakly granose radial riblets.

Eopecten thurmanni (Brauns)

Pl. 6, fig. 8

1850*b*. *Hinnites inaequistriatus* d'Orbigny : 22 (*ex* Voltz MS. ; a secondary homonym of *Lima inaequistriata* Goldfuss, 1836, also an *Eopecten*).
1862. *Hinnites inaequistriatus* d'Orb. ; Thurmann & Étallon : 267, pl. 37, fig. 13.
1863. *Hinnites inaequistriatus* d'Orb. ; Dollfus : 26, pl. 16, figs. 1–3.
1872. *Hinnites inaequistriatus* (Voltz) ; de Loriol : 391, pl. 23, figs. 1, 2.
1874. *Hinnites thurmanni* Brauns : 343.
1881. *Hinnites inaequistriatus* (Voltz) ; Boehm : 181, pl. 40, fig. 1.
1881. *Hinnites gigas* Boehm : 182, pl. 40, figs. 11, 12.
1897. *Hinnites* (*Pleuronectites*) *inaequistriatus* (Voltz) ; Futterer : 588, pl. 19, figs. 6, 7.
1915. *Hinnites* (*Prospondylus*) *orbignyi* Rollier : 464.
1915. *Hinnites* (*Prospondylus*) *dollfusi* Rollier : 465.
1933. *Velata inaequistriata* (Voltz) ; Dietrich : 67, pl. 8, fig. 129.
1936. *Velata inaequistriata* (Étal.) ; Dechaseaux : 71.

MATERIAL. Two left valves (nos. L.83900, L.92195).

LOCALITIES AND HORIZONS. 7 miles N.N.E. of Raiya hills, N.E. Kenya ; Upper Oxfordian, Seir Limestones. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya ; Kimmeridgian, Hereri Shales.

REMARKS. One of these two specimens is remarkable for its size, its diameter being about 90 mm. It is a well-inflated valve, ornamented with a relatively small number (about 8) of rather unevenly spaced, prominent ribs, separated by wide intervals occupied by numerous radial threads which alternate in strength more or less regularly ; there is a slight tendency for the middle thread of each main interval to be more prominent than the others. This specimen seems to be larger than any hitherto recorded under the specific name *inaequistriata*, but it is smaller than Boehm's *Hinnites gigas*, a shell 155 mm. high. Notwithstanding the very irregular arrangement of its ribs, it is now suggested that Boehm's species should be considered a synonym of the *inaequistriata* of authors. The necessity for adopting Braun's name *thurmanni* for this species is indicated by the synonymy here given. The European range of this species is from the Upper Oxfordian to the Kimmeridgian.

Eopecten aff. ***albus*** (Quenstedt)

Pl. 6, fig. 7

1836. aff. *Spondylus velatus* Goldfuss : 94, pl. 105, figs. 4*a–d* (secondary homonym of *Pecten velatus* Goldfuss, 1833 : 45, also an *Eopecten*).
1857. aff. *Pecten velatus albus* Quenstedt : 628, pl. 78, fig. 3.
1878. aff. *Hinnites astartinus* Greppin ; de Loriol : 163, pl. 23, fig. 3.
1904. aff. *Hinnites bonjouri* de Loriol : 231, pl. 25, figs. 1, 2.
1926. aff. *Velopecten velatus* (Goldfuss) ; Staesche : 122, pl. 6, fig. 11.
1936. aff. *Velata bonjouri* (de Loriol) ; Dechaseaux : 70, pl. 8, fig. 14.
1960. *Eopecten* cf. *bonjouri* (de Loriol) ; Joubert, pl. 8, fig. 2.

MATERIAL. One specimen (no. L.92247).

LOCALITY AND HORIZON. Wilderri hill, 11 miles S.S.W. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones.

REMARKS. This specimen, a strongly convex left valve of an *Eopecten*, is only about 22 mm. high and not identifiable specifically with any certainty. There are about 13 rather irregularly spaced, weak, narrow principal radial costae which are separated by flat intervals ; a weak thread of secondary strength is present in one or two of these, but otherwise they appear smooth. It is probable that a few more ribs of primary strength would have appeared as the shell grew. The specimen bears some resemblance to de Loriol's fig. 2 of *Hinnites bonjouri*, a species considered by Staesche to be a synonym of the form to which he applies the name *Velopecten velatus*, a secondary homonym. The name *albus* Quenstedt is here accepted for the species. In Germany, according to Staesche, this ranges throughout the Malm, or Upper Jurassic.

Genus ***CAMPTONECTES*** Meek 1864

Camptonectes auritus (Schlotheim)

1813. *Chamites auritus* Schlotheim : 103.
1929. *Chlamys* (*Camptonectes*) *lens* (Sowerby) ; Weir : 25, pl. 1, fig. 39.
1930*a*. *Camptonectes lens* (Sowerby) ; Arkell : 94, pl. 7, fig. 1 ; pl. 9, figs. 4–7.
1948. *Camptonectes auritus* (Schlotheim) ; Cox & Arkell : 14.
1960. *Camptonectes aurites* [*sic*] (Schlotheim) ; Joubert, pl. 7, figs. 3*a–e*.

Material. Several specimens.

Localities and horizons. Kulong, 2 miles S.W. of Muddo Erri, also top of hills S. of Rahmu–Melka Murri road, 10 miles W. of Rahmu, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones. 2½ miles S.W. of Rahmu, N.E. Kenya ; Oxfordian, Rahmu Shales. Dussé, 1½ miles S.E. of Rahmu ; Upper Oxfordian, Seir Limestones.

Genus ***CHLAMYS*** Röding 1798

Chlamys curvivarians (Dietrich)

1929. *Chlamys* aff. *palmyrensis* (Krumbeck) ; Weir : 24, pl. 1, figs. 34, 35.
1929. *Chlamys* sp. ; Weir : 25, pl. 1, fig. 38.
1933. *Pecten* (*Chlamys*) *curvivarians* Dietrich : 63, pl. 8, figs. 122, 123.
1935*a*. *Chlamys curvivarians* (Dietrich) ; Cox : 176, pl. 18, figs. 14, 15.
1939. *Chlamys curvivarians* (Dietrich) ; Stefanini : 183, pl. 20, fig. 9.
1952. *Chlamys curvivarians* (Dietrich) ; Cox : 8, pl. 2, figs. 5, 8.
1960. *Chlamys curvivarians* (Dietrich) ; Joubert, pl. 7, fig. 5.

Material. Several specimens.

Localities and horizons. 2 miles S. of Melka Biini, N.E. Kenya ; Bathonian, Murri Limestones. 3½ miles W. of Melka Biini ; Callovian, Rukesa Shales. Kulong, 2 miles S.W. of Muddo Erri ; also top of hills S. of Rahmu–Melka Murri road, 10 miles W. of Rahmu, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya ; Kimmeridgian, Hereri Shales. Finno, Hegalu hills, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

Remarks. This species has been fully discussed in the papers cited. Its long range in East Africa is indicated by the occurrences stated above.

Chlamys subtextoria (Münster)

Pl. 7, fig. 8

1833. *Pecten subtextorius* Münster in Goldfuss : 48, pl. 90, figs. 11*a*, *b*.
1857. *Pecten textorius albus* Quenstedt : 627, pl. 77, figs. 25, 26.
1894. *Pecten bipartitus* Futterer : 32, pl. 5, figs. 4, 4*a*.
1926. *Chlamys subtextoria* (Münster) ; Staesche : 40 (*partim*) (*non* pl. 1, fig. 4).
1936. *Chlamys subtextorius* (Goldfuss) ; Dechaseaux : 19, pl. 3, fig. 2.
1936. ?*Chlamys Etiveyensis* (de Loriol) ; Dechaseaux, pl. 3, figs. 3, 4.

Material. One specimen (no. L.54116).

Locality and horizon. S. of Tarawanda, 11 miles S.E. of Lugoba, Tanganyika ; Callovian.

Description. This specimen, a right valve about 22 mm. high, is characterized by its rather tall, trigonal outline, its slightly acute umbonal angle, and the relatively elongate dorsal margins of the disc. Its narrow, acutely angular costae, about 33 in number, are distributed a little irregularly, with no pronounced tendency to be arranged in pairs. On the least eroded parts of the surface the ribs and their intervals are seen to be crossed by concentric lamellae. The upper margin of the anterior auricle slopes upward from the umbo. Growth stages of the inner margin of the subauricular notch are marked by a series of lamellae.

REMARKS. Staesche has placed *Pecten etiveyensis* de Loriol (1904, pl. 24, fig. 1) in the synonymy of *C. subtextoria*, but Mlle Dechaseaux has regarded the two forms as distinct, stating that *etiveyensis* differs in the regularity, equality, and rounded (rather than angular) cross-section of its numerous ribs, points of distinction also emphasized by de Loriol when describing the species. By these criteria, Staesche's figured specimen of "*subtextoria*" would be referable to *etiveyensis*. Mlle Dechaseaux's figures (pl. 3, figs. 3, 4) of specimens referred to *etiveyensis* rather contradict this distinction, however, as they indicate a decidedly irregular arrangement of the costae, which also appear to have broader intervals than in the typical *etiveyensis*. In its tall, trigonal form and acute umbonal angle the East African specimen now recorded more closely resembles the specimens which Mlle Dechaseaux figures as *etiveyensis* than the one attributed to *subtextoria*, although the obtusely angular ribs are like those of the last specimen. It is possible that Staesche's broader conception of the species *subtextoria* is justified. The references given in the above synonymy are, however, to illustrations of specimens in which the ribbing is less regular and the intervals are broader than in the typical *etiveyensis*. *Pecten bipartitus* Futterer (1894: 32, pl. 5, figs. 4, 4*a*), from Oxfordian beds at Mkusi, 16 miles N.E. of Mtaru, Tanganyika, does not seem to differ from *C. subtextoria*; whereas it was described as having 18–20 ribs, 30 can be counted in the figure.

Chlamys matapwaensis sp. nov.

Pl. 7, figs. 1*a*, *b*, 2*a*, *b*

DIAGNOSIS. Small, subequivalve, of slight convexity, inequilateral, height (c. 11 mm. in larger specimen) just exceeding length (10 mm.). Valves ornamented with 22 or rather more slightly unevenly spaced, rounded, smooth riblets of moderate prominence, the outer ones curving outwards towards the adjacent margin; the riblets may increase in number to a small extent during growth by dichotomy or by intercalation, the latter occurring mainly at a late growth-stage and only in some of the outer intervals. Intervals flat, their average width about the same as that of the riblets, ornamented with very fine concentric threads. Right posterior auricle obtusely triangular; other auricles unknown complete; byssal sinus unknown; part of right anterior auricle closest to body of shell bearing series of closely spaced, equal threads perpendicular to the hinge-margin.

HOLOTYPE AND PARATYPE. Nos. LL.35096, LL.35097 respectively (*ex* B.P. Coll.).

LOCALITY AND HORIZON. N. of Matapwa, Pindiro area, Tanganyika; Upper Kimmeridgian.

REMARKS. In *Chlamys curvivarians* (Dietrich), recorded above, the riblets are narrower and more numerous.

Subgenus ***RADULOPECTEN*** Rollier 1911

Chlamys (Radulopecten) inequicostata (Young & Bird)

Pl. 7, fig. 5

1822. *Pecten inequicostatus* Young & Bird : 236, pl. 9, fig. 7.
1829. *Pecten inaequicostatus* Phillips : 129, pl. 4, fig. 10.
1931*a*. *Chlamys* (*Radulopecten*) *inaequicostata* (Phillips) ; Arkell : 118, pl. 8, figs. 4–7 (also 1935, pl. 52, figs. 1, 3).
1960. *Chlamys* (*Radulopecten*) cf. *inaequistriata* (Phillips) ; Joubert, pl. 7, fig. 4.

MATERIAL. One specimen (no. L.92228).

LOCALITY AND HORIZON. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones.

DESCRIPTION. This specimen, which lacks the umbonal region and auricles and is rather eroded, was originally about 67 mm. high and 50 mm. long. The right valve has about six broad, depressed, rounded ribs which are separated by equally broad intervals ; ribs and intervals are crossed by fine, closely spaced, rather irregular, erect lamellae. The left valve has six ribs which are narrower than those of the right valve and are separated by intervals most of which are slightly broader than the ribs. One of the outer ribs on the anterior side bears short, spine-like projections, but details of the ornament are not preserved on the others.

REMARKS. The African specimen differs from most examples of the species from the Corallian Beds of England, the type occurrence, in the relative broadness of the intervals between the costae of the right valve, but in occasional specimens from England the intervals are just as broad. I see no reason, therefore, for separating the African specimen from *C. inaequicostata*, which is also known from France, Germany, Poland, and Switzerland. In Europe the species occurs in the Upper Oxfordian and Lower Kimmeridgian.

Chlamys (Radulopecten ?) kinjeleensis sp. nov.

Pl. 7, figs. 6*a*, *b*, 7*a*, *b*

DIAGNOSIS. Shell small (height of holotype, the largest specimen, c. 13 mm.), suborbicular, subequivalve, moderately convex. Ornament consisting of about 10 regularly arranged, broad, rounded radial costae, separated by slightly narrower, rounded intervals ; ribs and intervals crossed by concentric threads (removed by erosion except on a few small areas of the surface in the available specimens). Right anterior auricle small, bearing two weak radial riblets ; posterior auricles rather small, obtusely triangular. Byssal notch deep.

HOLOTYPE AND PARATYPES. Holotype, no. L.51955, a right valve. Three paratypes (including nos. L.52145 and LL.35098, *ex* B.P. Coll.).

LOCALITIES AND HORIZONS. N. of Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru, Tanganyika (type-locality) ; Upper Kimmeridgian, *Nerinella* Bed. Lilomba creek, Tendaguru, Tanganyika ; Upper Kimmeridgian, "*Trigonia smeei*" Bed. Mpilepile stream bed, near Mitole, and Kiwawa stream, both northern Mandawa area, Tanganyika ; Upper Kimmeridgian.

Remarks. This species appears to be closely related to *Chlamys* (*Radulopecten*) *inaequicostata*, recorded above, but is much smaller and has more ribs. The specimens, although from four different localities, are all of about the same size, so that it has been assumed that they are full-grown.

Subgenus ***SPONDYLOPECTEN*** Roeder 1882

Chlamys* (*Spondylopecten* ?) *badiensis Cox

Pl. 7, figs. 3, 4

1952. *Chlamys* (*Spondylopecten* ?) *badiensis* Cox : 16, pl. 1, figs. 14*a*, *b*.

Material. Two specimens (nos. L.93552, LL.35099), the latter *ex* B.P. Coll.

Localities and horizon. Namakambe stream, Mandawa–Mahokondo anticline, Tanganyika ; probably Callovian. ½ mile N.W. of bridge over Mkulumuzi river, 2 miles W. of Tanga, Tanganyika ; Callovian.

Description. Both specimens have 23 rounded, moderately prominent ribs, as in the holotype of *C. badiensis*. In one specimen the dorsal margins of the body of the shell are concave and extend almost to the middle of the height of the valve, the ventral margin of which forms a semicircle. In the second specimen the dorsal margins are relatively short, extending only to the dorsal third of the height of the valve, and the ventral margin is semi-elliptical. Although the two specimens thus differ considerably in outline, it is thought that they belong to the same species. In the first and less eroded specimen, a right valve 28 mm. high, the ribs bear a median and two lateral rows of small scales, together with regular, delicate transverse striations which are arched towards the umbo. The narrow, V-shaped intervals are also transversely striated and are bordered on each side by a longitudinal thread at the base of the adjacent rib. The second specimen, a left valve of about the same height, retains traces of similar ornament in places. The auricles are imperfect in both specimens, but can be seen to bear squamose or beaded radial riblets.

Remarks. *C. badiensis*, the holotype of which came from the Callovian of Cutch, is closely related to the French Callovian species *C. palinurus* (d'Orbigny) (*see* Cossmann, 1913*a* : 2, pl. 11, figs. 1–4 ; 1924 : 29, pl. 5, figs. 5, 6), but in that species the number of ribs is only 20. Other related forms are *C. syriaca* Cossmann (1925 : 325, pl. 8, figs. 7*a*–*c*), with about 30 ribs, and *C. macfadyeni* Cox (1935*a* : 176, pl. 18, figs. 11*a*, *b*), with 19 ribs. All possibly could be geographical races of *C. palinurus*. The ligamental area of the right valve has not been observed in any of these forms, but their tentative reference to *Spondylopecten* is suggested by their external similarity to *Pecten erinaceus* Buvignier, its type species.

Genus *WEYLA* Boehm 1920

Weyla ambongoensis (Thevenin)

Pl. 7, figs. 9*a*, *b*, *c*

1908*b*. *Pecten ambongoensis* Thevenin : 24, pl. 4, figs. 2, 3.
1948. *Pecten ambongoensis* Thev. ; Dubar : 220, pl. 29, figs. 7–9.

Material. Numerous specimens.

Locality and horizon. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

Remarks. The specimens now recorded are quite typical of this species, which is known from the Upper Lias of Pakistan and Morocco as well as from the type-locality in Madagascar.

Superfamily **LIMACEA**

Family **LIMIDAE** Rafinesque 1815

Genus ***LIMA*** Cuvier 1798

Subgenus ***PLAGIOSTOMA*** J. Sowerby 1814

Lima (Plagiostoma) biiniensis sp. nov.

Pl. 8, fig. 1

1929. Cf. *Lima* (*Plagiostoma*) cf. *rigida* Sow. ; Weir : 27, pl. 2, fig. 2.
1960. *Lima* (*Plagiostoma*) sp. nov. ; Joubert, pl. 8, fig. 4.

Diagnosis. Of medium size (height of holotype c. 53 mm.), suborbicular, slightly higher than long ; inflation even and moderate. Ventral margin strongly convex and not pronouncedly asymmetrical ; umbonal region obtusely angular in outline, its angle about 100° ; anterior umbonal ridge rounded off, relatively short. Main part of surface bearing numerous (probably about 70) radial riblets which project very little, are flat-topped in the holotype, and are separated by much narrower intervals which are seen to be punctate where the shell is least eroded. Auricles not preserved.

Holotype. No. L.92174. A few other specimens in the material studied may belong to the same species but are all imperfect and cannot rank as paratypes.

Localities and horizons. 2 miles W. of Melka Biini, N.E. Kenya ; Bathonian, Murri Limestones. Possible representatives of the species from Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Remarks. The ornament of this species much resembles that of the Bajocian species *L. semicircularis* Goldfuss, discussed by the present writer (Cox 1943 : 160, pl. 10, figs. 13, 14). The new species differs, however, in its more even inflation, its shorter and less marked anterior umbonal ridge, and its fewer radial ribs (their number is 80–90 in *L. semicircularis*). There are many records of *L. semicircularis* from the Bathonian, but not one where the recorded specimens are illustrated can be accepted. The specimen figured under this name by Morris & Lycett (1853, pl. 3, fig. 3) has been made the type of a new species *L. bynei* by Cox & Arkell (1948 : 17) and has fewer ribs than the form now described. Weir (1938, pl. 4, fig. 16) has figured a specimen from the Kambe Limestone (Upper Bajocian or Bathonian) of Kenya as *L.* cf. *semicircularis*. Its ribbing has been largely removed by erosion, but its outline resembles that of the species now described.

***Lima* (*Plagiostoma*) cf. *schardti* de Loriol**

1883. Cf. *Lima schardti* de Loriol : 71, pl. 10, figs. 5–11.
1960. *Lima* (*Plagiostoma*) cf. *schardti* de Loriol ; Joubert, pl. 8, fig. 3.

MATERIAL. Several imperfect specimens.

LOCALITIES AND HORIZONS. Hills S. of Melka Murri–Rahmu road, 13 miles W. of Rahmu, N.E. Kenya ; Callovian, Rukesa Shales. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

REMARKS. In this species, originally described from the *Mytilus* Beds (Bathonian–Callovian) of Switzerland, the valves bear about 26 scaly ribs separated by intervals which are of the same width as the ribs over the greater part of the surface but become wider than them near the ventral margin. The ribs cannot be counted exactly in the specimens now recorded but their spacing is exactly as indicated in de Loriol's figures and their scaly character can be seen in places. The general outline of the shell is also as indicated by de Loriol.

***Lima* (*Plagiostoma*) *muddoensis* sp. nov.**

Pl. 8, fig. 2

1960. *Lima* (*Plagiostoma*) cf. *complanata* Laube ; Joubert, pl. 8, fig. 5.

DIAGNOSIS. Of small-medium size (height of holotype c. 35 mm.), trapezoidal, length and height almost equal ; inflation rather weak in holotype, but this is probably partly due to compression in fossilization. Ventral margin moderately asymmetrical ; umbonal region not protruding, very slightly obtuse in outline, its angle about 100° ; anterior umbonal ridge rounded off, straight, forming an angle with the hinge-line which slightly exceeds 45°. Lunule scarcely excavated. Posterior auricle relatively large, its outer angle only slightly obtuse ; anterior auricle not seen. Main surface bearing about 30 prominent, rounded ribs which are equal in strength and appear smooth except in late stages of growth, when they bear transverse imbrications. Intervals about same width as ribs and apparently without punctations. Posterior auricle with about 6 nodose radial ribs.

HOLOTYPE. No. L.92065 ; the material examined includes about two other specimens which probably belong to the same species but are too imperfect to rank as paratypes.

Locality and horizon. Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Remarks. This *Lima*, although rather similar to several previously described species, cannot be identified definitely with any of them. *L. complanata* Laube (1867 : 24, pl. 1, fig. 11), Callovian of Poland, has a narrower body and umbonal region, a smaller posterior auricle, and more ribs. In *L. paolii* Stefanini (1939 : 164, pl. 19, figs. 7, 8), from the " Lower Oolitic " of Somaliland, there are 36–38 ribs which are much more depressed than in the new species and have narrower intervals. In *L. subcardiiformis* Greppin, a widespread Bathonian species, the ribs are much more numerous. Of the varied series of Limidae occurring in the Bajocian of England, *L. bradfordensis* Cox (1943 : 159, pl. 9, fig. 10) is quite closely similar to the present species, but its ribs are relatively broader and their intervals narrower. *L. notata* Goldfuss (1836 : 83, pl. 102, figs. 1*a*, *b*), of the Upper Oxfordian and Kimmeridgian, is more equilateral in outline.

***Lima* (*Plagiostoma*) cf. *jumaraensis* Cox**

1952. Cf. *Lima* (*Plagiostoma*) *jumaraensis* Cox : 52, pl. 5, figs. 4*a*, *b*, 5.

Material. About four ill-preserved specimens.

Locality and horizon. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Remarks. In this species, originally described from the Bathonian and Callovian of India, the narrow ribs are very depressed, projecting only slightly between the radiating linear grooves which separate them. In the specimens now recorded the ornament agrees well with that of the Indian ones, but not one is well enough preserved to show the complete outline of the shell. The specimens from Somaliland recorded by Stefanini (1939 : 162, pl. 19, figs. 5*a*, *b*, 6*a*, *b*) as *Lima* (*Plagiostoma*) *strigillata* Laube are very similar to those now described, some of which were provisionally identified (Joubert 1960 : 18) as Laube's species after comparison with Stefanini's figures.

***Lima* (*Plagiostoma*) *rahmuensis* sp. nov.**

Pl. 7, figs. 10*a*, *b*

Diagnosis. Of medium size (height of holotype c. 35 mm.), trapezoidal, slightly higher than long, well inflated. Ventral margin moderately asymmetrical ; umbonal region obtusely angular in outline, its angle about 120° ; anterior umbonal ridge rounded off, straight, not greatly elongated, forming an angle of about 45° with the hinge-margin ; lunule well excavated. Main part of surface bearing numerous punctate linear radial grooves, about 7 of which occcupy a width of 5 mm. near the ventral margin ; spaces between grooves quite flat.

Holotype. No. L.83892. The only specimen.

Locality and horizon. 2½ miles S.W. of Rahmu, N.E. Kenya ; Oxfordian, Rahmu Shales.

Remarks. This species closely resembles *Lima* (*Plagiostoma*) *punctata* J. Sowerby, of the Lias. Of comparable Upper Jurassic species, *L. boidini* Sauvage (de Loriol 1875 : 171, pl. 21, figs. 8, 9), Portlandian of northern France, is elongated in a more oblique direction and its punctate grooves are more broadly spaced. *L. libanensis* Krumbeck (1905 : 99, pl. 10, fig. 5), Lower Kimmeridgian of Syria, is described as having distinctly raised but at the same time very depressed ribs, although this is not obvious in the figures. *L. harronis* Dacqué (1905 : 133, pl. 15, figs. 13, 14), Kimmeridgian of Somaliland, is a narrower and more oblique shell with distinctly raised ribs. *L. thisbe* de Loriol (1888 : 322, pl. 36, figs. 1–4), Lower Kimmeridgian of the French Jura, and *L. burensis* de Loriol (1893 : 331, pl. 34, figs. 11, 12 ; 1895 : 47, pl. 9, fig. 2) and *L. trembiazensis* de Loriol (1901 : 102, pl. 5, fig. 24), both from the Upper Oxfordian of the Swiss Jura, have distinctly raised ribs separated by punctate grooves which are more closely spaced than in the form now described.

Lima* (*Plagiostoma*) *sublaeviuscula Krumbeck

Pl. 8, figs. 5, 6

1905. *Lima sublaeviuscula* Krumbeck : 99, pl. 3, figs. 3*a*, *b*.

Material. Two specimens.

Locality and horizon. 5 miles S. of Galgali Gambo, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

Remarks. These specimens, the larger of which is about 80 mm. high, are larger than Krumbeck's type-specimen, but are similar to it in shape and have exactly the same characteristic ornament of very depressed radial ribs which are unequal and irregularly spaced, and are confined to the anterior, posterior and ventral parts of the surface, the middle of which is smooth. The intervals between the ribs are relatively narrow and do not seem to be punctate. It seems doubtful if *L. informis* Krumbeck (1905 : 100, pl. 3, figs. 7*a*–*c*) is specifically distinct from *L. sublaeviuscula*, although stated to be less inequilateral, higher in proportion to its breadth and more gibbose, and to have a shorter and broader lunule. Both forms, described originally from the Lower Kimmeridgian of Syria, differ only in minor details from the Upper Oxfordian species *L. laeviuscula* (J. Sowerby), in which the shell seems to be slightly broader and the ribs less numerous. A specimen (L.92235) from the Seir Limestones (Oxfordian) of N. Kenya identified (Joubert 1960, pl. 8, fig. 6) as *Lima* (*Plagiostoma*) cf. *laeviuscula* may well belong to Sowerby's species, but is broken anteriorly and too imperfect for definite identification.

Subgenus ***ACESTA*** Adams 1858

Lima* (*Acesta*) *kindopeensis sp. nov.

Pl. 8, fig. 10

Diagnosis. Of medium size (height of holotype c. 47 mm.), ovate-trapezoidal, with a slight lunate tendency ; length, parallel to hinge-margin, almost equal to height ; posterior margin short, ventral margin strongly asymmetrical, feebly convex posteriorly, strongly convex anteriorly. Inflation weak. Umbonal region sharply rounded in outline, its angle less than a right angle. Anterior umbonal ridge rounded off, fading away before reaching somewhat upturned antero-ventral part of shell. Lunule short, well excavated. Posterior auricle small and obtuse, anterior auricle virtually absent. Ornament consisting of 43 broad, depressed ribs which are interrupted by irregularly and rather distantly spaced growth-rugae and in the holotype are deflected in an anterior direction at the stage when the shell was about three-quarters fully grown. Intervals between ribs narrow and shallow, apparently not punctate.

HOLOTYPE. No. L.56240. The only specimen.

LOCALITY AND HORIZON. Kindope, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. Although much of the holotype is an internal mould, the original shell is preserved in places, particularly in the antero-ventral region. This species is comparable to *L. monsbeliardensis* Contejean (de Loriol 1872 : 377, pl. 22, figs. 2, 2*a*), from the Lower Kimmeridgian of Europe, but has fewer ribs and also differs in its somewhat lunate outline. In *L. virgulina* Contejean (1860 : 308, pl. 23, figs. 1, 2), another rather similar species from the Kimmeridgian of Europe, the ribs are even more numerous. In *L. meroe* de Loriol (1894*a* : 151, pl. 10, figs. 17, 18), Lower Kimmeridgian of France, there are about 60 ribs and a distinct anterior auricle is present.

Lima* (*Acesta*) *cutleri sp. nov.

Pl. 8, fig. 9

SPECIFIC NAME. After the late W. E. Cutler, the first leader of the British Museum East Africa Expedition.

DIAGNOSIS. Relatively small, narrowly subovate, broadening ventrally, and with a slight lunate tendency ; height much exceeding length ; inflation moderate. Posterior and ventral margins forming an uninterrupted curve, the lower part of which is strongly and asymmetrically convex ; anterior margin very slightly concave. Umbonal region narrow, no distinct umbonal ridges ; no lunule. Posterior auricle obtuse, not distinctly delimited from body of shell ; anterior auricle virtually absent. Ornament consisting of slightly sinuous, punctate, linear grooves, the intervals between which are flat and do not form distinct ribs except on anterior part of surface, where they are slightly elevated. Grooves close together on posterior part of surface but more widely spaced on anterior part ; their total number exceeds 60. There are also a few well-marked and very irregularly distributed growth-rugae.

HOLOTYPE AND PARATYPES. Holotype, no L.52033. There are several paratypes.

LOCALITIES AND HORIZON. Tingutitinguti creek (type-locality) ; Nitongola creek, and Kindope valley, all near Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

REMARKS. This shell is much narrower than *L. kindopeensis* sp. nov., described above, and also differs in the absence of a distinct anterior umbonal ridge and lunule and of distinct radial ribs except on the anterior part of the surface.

Genus ***PSEUDOLIMEA*** Arkell 1932

Pseudolimea duplicata (J. de C. Sowerby)

Pl. 8, figs. 8*a*, *b*

1827*a*. *Plagiostoma duplicata* J. de C. Sowerby : 114, pl. 559, fig. 3.
1932*a*. *Lima* (*Pseudolimea*) *alternicosta* Buvignier ; Arkell : 140, pl. 13, figs. 3–5.
1933. *Lima* (*Radula*) sp. ; Dietrich : 63, pl. 7, figs. 96–98.
1944*a*. *Pseudolimea duplicata* (Sow.) ; Cox : 84.
1952. *Pseudolimea duplicata* (Sow.) ; Cox : 60, pl. 5, figs. 11, 12.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones. Kindope, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. The *Pseudolimea* which occurs in some abundance at Tendaguru and was recorded as *Lima* (*Radula*) sp. by Dietrich does not appear to be distinguishable specifically from the long-ranging species *P. duplicata*, the synonymy of which is given in my two papers cited above. The largest Tendaguru specimens are, indeed, only 13 mm. high and thus smaller than specimens from many localities, but the general proportions of the shell, the number of ribs (22) and their V-shaped cross-section, and the presence of a radial thread in each interval are exactly as in *P. duplicata*. The specimens from lower horizons in northern Kenya are in every way typical. The known range of the species in Europe is from Toarcian to Upper Oxfordian, with an unconfirmed record from the Portlandian.

Pseudolimea mandawaensis sp. nov.

Pl. 8, fig. 3

DIAGNOSIS. Large for a *Pseudolimea*, broadly trapeziform, length and height about equal (c. 40 mm.), ventral margin strongly asymmetrical, umbonal region slightly obtuse. Postero-dorsal region only slightly impressed ; auricles unknown. Main ribs about 23, obtusely angular, depressed, with broadly rounded, slightly unequal intervals bearing numerous fine, unevenly spaced radial threads with one near middle slightly more prominent than the others ; in addition, a few weak, jagged radial riblets occupy anterior and posterior ends of shell. Concentric ornament, except near ventral margin, consisting of closely and evenly spaced threads which are even more delicate than the radials ; late growth stages, however, are marked by irregular concentric rugae.

Holotype. No. LL.35100, *ex* B.P. Coll. The only specimen.

Locality and horizon. Lihimaliao creek, Mandawa area, Tanganyika ; Upper Oxfordian.

Remarks. The original convexity of the holotype, a rather crushed specimen, does not appear to have been very strong. The ornament recalls that of the two Liassic species *Pseudolimea pectinoides* (J. Sowerby) and *P. roemeri* (Brauns), and, although its internal characters are unknown, the species is referred to *Pseudolimea* with some confidence. *Lima mistrowitzensis* Boehm (1883 : 638, pl. 69, figs. 21, 22), from the Tithonian Stramberg beds, is a comparable species, but has fewer radial ribs.

Genus *LIMATULA* Wood 1839

Limatula moorei sp. nov.

Pl. 8, figs. 7*a*, *b*

Specific name. After Mr. W. R. Moore, of the Tanganyika Geological Survey, collector of the holotype.

Diagnosis. Small (height 9·0 mm., length 7·0 mm.), tall, ovate, slightly asymmetrical, with prominent umbo ; surface evenly inflated. Ornament confined, as in all *Limopsis*, to median part of flank, and consisting of smooth, rounded, not very prominent ribs separated by intervals which are only about one-third as wide as ribs and bear delicate growth-threads near ventral margin. Ribbed part of surface merges gradually on both sides into smooth anterior and posterior parts ; number of ribs, apart from very weak outer ones, about 15.

Holotype. No. LL.16799, a right valve. The only specimen.

Locality and horizon. Usigiwa river, 6 miles W.S.W. of Kiwangwa, Bagamoyo hinterland, Tanganyika ; Upper Oxfordian.

Remarks. The broadly rounded ribs and narrow intervals distinguish this form from most of the species of *Limatula* described previously from the Middle and Upper Jurassic, including *L. boehmi* de Loriol, *L. consobrina* (d'Orbigny), *L. gerassimovi* Pchelintsev, *L. gibbosa* (J. Sowerby), *L. globularis* Laube, *L. helvetica* (Oppel), *L. oxfordiana* Maire, *L. praedispersa* Krause, and *L. rauracica* Cossmann. In *L. minutissima* (d'Orbigny) (= *Lima minuta* Roemer *non* Goldfuss ; synonym, *Lima suprajurensis* Contejean) the ribs are just as broad as in the species now described, but they are scaly or tuberculate, while the shell itself is more distinctly truncated posteriorly.

Limatula migeodi sp. nov.

Pl. 8, figs. 4*a*, *b*

Specific name. After the late F. W. H. Migeod, for some years leader of the British Museum East Africa Expedition.

Diagnosis. Small (height of holotype 10·5 mm.), ovate, breadth nearly three-quarters of height ; slightly oblique. Auricles moderately large, obtuse-angled, the posterior slightly the larger. Median part of valve ornamented with 13 angular costae which are separated by slightly narrower, angular intervals and bear small, evenly spaced nodes. Ribbed area sharply separated from anterior and posterior parts of surface, which are smooth except for a few faint radial lines and growth-lines.

HOLOTYPE AND PARATYPE. Nos. LL.11514, LL.11515 respectively.

LOCALITY AND HORIZON. Kindope, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. A species *Limatula tendagurensis* Lange (1914 : 207, pl. 15, figs. 6*a*, *b*) was described from the Neocomian of Tendaguru, and Dietrich (1933 : 63) has stated that it ranges throughout the whole series of beds at that locality. The Jurassic form now described differs, however, from Lange's figures in its more strongly convex anterior and posterior margins and its broader proportions. It also has fewer ribs, the number mentioned by Lange being 15–17 in addition to some weaker ones which extend on to the lateral parts of the surface.

Genus ***CTENOSTREON*** Eichwald 1862

Ctenostreon proboscideum (J. Sowerby)

1820*a*. *Lima proboscidea* J. Sowerby : 115, pl. 264.
1932*a*. *Ctenostreon proboscideum* (Sowerby) ; Arkell : 145, pl. 15, fig. 3.
1937. *Ctenostreon proboscideum* (Sowerby) ; Hennig : 180.
1960. *Ctenostreon proboscideum* (Sowerby) ; Joubert : pl. 8, fig. 7.

MATERIAL. One specimen (no. L.92184).

LOCALITY AND HORIZON. Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

REMARKS. The specimen now recorded is a relatively small, ill-preserved internal mould with about nine radial ribs. The species was recorded by Hennig from beds thought to be Kimmeridgian in age at a locality in the Mandawa district of Tanganyika.

Superfamily **OSTREACEA**

Family **OSTREIDAE** Rafinesque 1815

Genus ***LOPHA*** Roeding 1798

Lopha costata (J. de C. Sowerby)

Pl. 9, figs. 1*a*, *b*, *c*

1825*a*. *Ostrea costata* J. de C. Sowerby : 143, pl. 488, fig. 3.
1853. *Ostrea costata* Sow. ; Morris & Lycett : 3, pl. 1, figs. 5, 5*a*.
1856. *Ostrea costata* Sow. ; Quenstedt : 497, pl. 66, figs. 43, 44.
1863. *Ostrea costata* Sow. ; Martin : 65, pl. 5, figs. 12–15.
1868. *Ostrea costata* Sow. ; Lycett, pl. 34, fig. 3.

1883. *Ostrea costata* Sow. ; de Loriol : 77, pl. 11, figs. 8–17.
1888. *Ostrea* (*Alectryonia*) *costata* Sow. ; Schlippe : 113, pl. 1, figs. 11, 12.
1912. *Alectryonia costata* Sow. ; Lissajous : 65, pl. 8, figs. 19, 20.
1916. *Ostrea* (*Alectryonia*) *costata* Sow. ; Jekelius : 230, pl. 4, figs. 3–6 ; pl. 6, fig. 9.
1923. *Alectryonia costata* Sow. ; Cossmann : 4, pl. 5, figs. 5–8.
1924. *Ostrea costata* Sow. ; Cossmann : 24, pl. 2, figs. 61–64.
1924. *Ostrea* (*Alectryonia*) *costata* Sow. ; Hennig : 33, pl. 3, fig. 2.
1929. *Arctostrea costata* (Sow.) ; Weir : 21, pl. 1, fig. 17.
1933. *Ostrea* (*Alectryonia*) *costata* Sow. ; Ruiz, in Fabiani & Ruiz : 14, pl. 2, fig. 1.
1934*b*. *Lopha costata* (Sow.) ; Arkell : 48, pl. 1, figs. 3–6.
1935. *Lopha costata* (Sow.) ; Cox : 173, pl. 17, fig. 13.

MATERIAL. One specimen (no. LL.35025) from the Toarcian and several from later beds.

LOCALITIES AND HORIZONS. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds. 3½ miles W. of Melka Biini, N.E. Kenya ; Callovian, Rukesa Shales. S. of Rahmu–Melka Murri road, 6 miles W. of Rahmu, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

DESCRIPTION. The Toarcian specimen now recorded is about 17 mm. high, with a deep lower valve, the sides of which rise steeply from a rather large attachment area. The sides have about 13 irregularly arranged costae, some of which have arisen during growth by bifurcation of single costae, and which are prominent except on the posterior and anterior ends of the valve. The costae are rounded at their crests and are separated by deep but rounded intervals of about their own average width. The upper valve is flat except for some irregularities and has a few weak radial plications. The specimens from later formations call for no particular comment.

REMARKS. I have hesitated before referring the Upper Liassic specimen to *L. costata*, as typically this is a Bathonian species and records of its occurrence even as early as the Bajocian have been queried (Whidborne 1883 : 492). Specimens from the Bajocian of the Cotswolds which I would refer to the species are, however, in the British Museum (Natural History). In typical specimens from the Great Oolite of England, such as those figured by Morris & Lycett (1853) and by Arkell (1934*b*), the plications are smaller and more numerous than in the specimen now recorded, and this is also the case in European Bathonian specimens figured by Schlippe (1888) and Cossmann (1923). In those figured by Lissajous (1912), however, the ribbing is of about the same strength as in the present shell, and this is also the case in the English Inferior Oolite specimens already mentioned. Cossmann (1924) has referred to the variability of specimens of *L. costata* from the French Callovian, and has stated that the number of ribs ranges from 12 to 18 irrespective of the geological horizon. *L. costata* is here accepted as a species ranging from Toarcian to Callovian, the present being the first record of its occurrence in the former stage. Thevenin (1908*b* : 21, pl. 4, figs. 10, 10*a*) has recorded a small plicated oyster from the Upper Lias of Madagascar under the name *Ostrea subserrata* Goldfuss, although Goldfuss's species is now known to have been a *Plicatula*. The specimen from Madagascar has narrow-

and, apparently, more lamellose plications than the shell now recorded ; it most probably also belongs to *L. costata*.

Lopha olimvallata nom. nov.

Pl. 9, figs. *2a, b*

1874. *Ostrea vallata* Dumortier : 203, pl. 45, figs. 7, 8 (*non* Thurmann & Étallon, 1862).
1905. ? *Ostrea* sp. ; Benecke : 161, pl. 12, fig. 12.
1929. *Alectryonia vallata* Dumortier ; Schäfle : 64, pl. 6, figs. 6–8.
1935. *Alectryonia vallata* Dumortier ; Kuhn : 119, pl. 8, fig. 30.

MATERIAL. One specimen (no. LL.35026).

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

DESCRIPTION. This specimen is an elongated, linguiform, shallow left valve 51 mm. high and 20 mm. broad, attached by almost its entire surface to a lamina of fibrous calcite, to the other side of which some smaller and less complete right valves are attached. The low sides of the valve rise steeply from the attachment area and have a number of rather weak, irregular plications. The umbo is directed in an anterior direction to a slight extent.

REMARKS. In the type-specimen of *Ostrea vallata*, which came from the Upper Lias of southern France, and in specimens from the Upper Lias of Germany figured by Schäfle, the height of the shell is only slightly in excess of the breadth. In the shell from the Aalenian of Lorraine figured by Benecke as " *Ostrea* sp. ", and considered by Schäfle to belong to Dumortier's species, the shape is narrow and linguiform and the umbo is directed anteriorly exactly as in the specimen now recorded, although the plications of the shallow sides of the valve are stronger and more numerous. The present specimen is thought to be referable to Dumortier's species as interpreted by Schäfle and now renamed.

Lopha gregarea (J. Sowerby)

Pl. 9, fig. 5

1815*a*. *Ostrea gregarea* J. Sowerby : 19, pl. 111, figs. 1, 3.
1933*a*. *Lopha gregarea* (Sowerby) ; Arkell : 183, pl. 22, figs. 5, 6 ; pl. 23, figs. 1–4.
1952. *Lopha gregarea* (Sowerby) ; Cox : 96, pl. 4, fig. 2 ; pl. 10, figs. 7–13.
1960. *Lopha gregarea* (Sowerby) ; Joubert, pl. 9, fig. 1.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. 3½ miles W. of Melka Biini ; also hills S. of Rahmu–Melka Murri road, 11 miles and 13 miles W. of Rahmu, N.E. Kenya ; Callovian, Rukesa Shales. S. of Rahmu–Melka Murri road, 6 miles W. of Rahmu, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones. 1¾ miles S.W. of Rahmu and 6½ miles S.S.W. of Rahmu, N.E. Kenya ; Oxfordian, Rahmu Shales. Wilderri hill, 11 miles S.S.W. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir

Limestones. 3 miles N.E. of Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones. 1¼ miles E. of Kidugallo Station, Central Railway, Tanganyika ; Bajocian, Station Beds.

Lopha eruca (Defrance)

1821. *Ostrea eruca* Defrance : 31.
1857. *Ostrea hastellata* [*rastellata*] Quenstedt : 750, pl. 91, figs. 26, 27.
1930. *Arctostrea hastellata* (?*non* Quenstedt ; de Loriol) ; Weir : 85, pl. 9, fig. 4.
1938. *Lopha krumbecki* Weir : 45, pl. 3, fig. 7.
1952. *Lopha eruca* (Defrance) ; Cox : 103, pl. 11, figs. 1–7.

MATERIAL. One internal mould (no. LL.35101), *ex* B.P. Coll.

LOCALITY AND HORIZON. ¼ mile from Msata on road to Bagamoyo, Tanganyika ; Callovian or Oxfordian (in friable brown sandstone).

REMARKS. Although merely an internal mould, this specimen undoubtedly belongs to Defrance's species, the full synonymy of which is given in my paper cited above. There is little doubt that the specimens from Kenya recorded by Weir (1930, 1938) belong to this species.

Lopha cf. ***intricata*** (Contejean)

Pl. 9, figs. 8*a*, *b*

1860. Cf. *Ostrea intricata* Contejean : 323, pl. 25, figs. 6–8.

MATERIAL. One specimen (no. L.83899).

LOCALITY AND HORIZON. 6½ miles S.S.W. of Rahmu, N.E. Kenya ; Oxfordian, Rahmu Shales.

REMARKS. This is a tall, oval, slightly oblique and lunate, weakly inflated specimen, 44 mm. in height and 28 mm. broad, with a large attachment area from which the walls of the lower valve, folded into plications of small amplitude, rise vertically to the commissure. The upper valve, which has an irregular surface, is weakly convex and also plicated at its margins. Except that its lower valve is not quite so deep, this specimen agrees well with Contejean's figure of the holotype of *Ostrea intricata*, a specimen of Lower Kimmeridgian age. In *O. vallata* Étallon (de Loriol 1894*b* : 75, pl. 9, figs. 5, 6), from the Swiss Oxfordian, the plications are sharper and more numerous. It is difficult to say whether or not these specimens are merely examples of better-known species of *Lopha* in which the development of plications on both valves has been restricted by an unusually large attachment-area.

Lopha solitaria (J. de C. Sowerby)

Pl. 9, fig. 4

1824*a*. *Ostrea solitaria* J. de C. Sowerby : 105, pl. 468, fig. 1.
1933*a*. *Lopha solitaria* (Sowerby) ; Arkell : 185, pl. 22, fig. 4 ; pl. 23, figs. 5–7.
1935*a*. *Lopha solitaria* (Sowerby) ; Cox : 171, pl. 17, figs. 9–12.
1960. *Lopha solitaria* (Sowerby) ; Joubert, pl. 9, figs. 2*a–c*.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. $1\frac{3}{4}$ miles S.W. of Rahmu, N.E. Kenya, and river section W. of Rahmu–El Wak road, $5\frac{1}{2}$ miles S.W. of Rahmu ; Oxfordian, Rahmu Shales. Golberobe hills, N.E. Kenya ; Oxfordian, Golberobe Beds. Dussé, $1\frac{1}{2}$ miles S.E. of Rahmu, N.E. Kenya, and Wilderri hill, 11 miles S.S.W. of Rahmu ; Upper Oxfordian, Seir Limestones. Chamgamwe, near Mombasa, Kenya ; Kimmeridgian, Chamgamye Shales.

Lopha tifoensis sp. nov.

Pl. 10, figs. 1, 2, 6, 7

1957. *Lopha* sp. ; Saggerson & Miller : 20, fig. e.

DIAGNOSIS. Shell small (height of largest specimen 27 mm.), trigonal to ovate, variable in proportions but usually higher than long, with deep but relatively thin-shelled lower valve and flat upper valve. Attachment-area conspicuous, fairly large in some specimens, terminal, truncating the umbonal region. Surface of lower valve with a series of irregularly distributed, rounded costae, some fading away during growth while others appear by intercalation and bifurcation, diverging to margins from points close to attachment-area. Where they first appear the number of costae is about 4–6 ; in the holotype, a specimen 14 mm. high, and in the largest paratype, mentioned above, the number of costae reaching the margin is about 10, but in another specimen, 18 mm. high, the number is 16. Upper valve with depressed, rounded radial costae originating at same stage of growth as in lower valve.

HOLOTYPE AND PARATYPES. Holotype, no. L.93574 ; several paratypes, of which L.93561, L.93563 and L.93580 are figured.

LOCALITIES AND HORIZON. Tifo (type-locality), Korkai Hammassa, Ogar Wein, Chimpa, and Asahaba, all N.E. Kenya ; Oxfordian, Golberobe Beds.

REMARKS. While in most specimens the height considerably exceeds the length, the specimen represented in fig. 2 is remarkable for its quadrate outline. Its attachment-area is unusually large and its ribs very weak. Some specimens of this species were originally identified as *Lopha costata* (J. de C. Sowerby), to which it appears to be closely related. It differs from Sowerby's species, however, in its much more depressed and rounded costae.

Lopha ? kindopeensis sp. nov.

Pl. 10, figs. 3, 4*a*, *b*, 5

DIAGNOSIS. Moderately large (height of holotype 96 mm.), trapezoidal, typically with more or less straight anterior and posterior margins diverging from the base of a broad ligamental area, and tending to be subangular postero-ventrally. Both valves fairly thick-shelled and almost flat, differing very little in convexity. (The left valve, however, is known only by imperfect specimens mostly growing attached to the greater part of the surface of right valves, the exteriors of which are thus obscured although their interiors are well exposed.) Adductor scar large. Margins of both valves with rounded, unevenly spaced plications which scarcely extend on surface of shell even where this is not obscured by adherent specimens. In one specimen which appears to be a left valve (although this is not altogether certain as its dorsal half is broken away) the somewhat eroded surface bears unevenly arranged, discontinuous pustules and superficial ribs.

HOLOTYPE AND PARATYPES. Holotype, no. L.54855 ; four paratypes, of which L.54856 and L.54858 are figured.

LOCALITIES AND HORIZON. Kindope (type-locality), and N. of Kinjele, both near Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. This form, with its weak plications confined to the margins, appears to lie on the border-line between *Ostrea* and *Lopha*. It is much larger but relatively less inflated than *Lopha intricata* (Contejean), referred to above, and also differs in its angular outline.

Lopha hennigi (Dietrich)

1933. *Alectryonia hennigi* Dietrich : 70, pl. 10, figs. 144, 145.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Mtapaia road and Kipande path, near Tendaguru, Tanganyika ; Upper Kimmeridgian, "*Trigonia smeei*" Bed. Kindope, near Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. This is a large, thick-shelled oyster with strong, angular, unequal plications, bifurcating in places. It is closely related to the widespread Jurassic species *L. marshii* (J. Sowerby), which occurs at lower horizons in East Africa, but is represented only by poor and somewhat doubtful specimens in the material studied.

Genus ***LIOSTREA*** Douvillé 1904

Liostrea dubiensis (Contejean)

1860. *Ostrea dubiensis* Contejean : 320, pl. 21, figs. 4–11.
1935*a*. *Ostrea* (*Liostrea*) *dubiensis* Contejean ; Cox : 171, pl. 17, figs. 4, 5.

MATERIAL. Numerous specimens.

LOCALITIES AND HORIZONS. 1 mile and 2 miles W. of Magindu Station, Central Railway, Tanganyika ; about Bathonian. 1 mile N. of Asaharbito, N.E. Kenya ; Bathonian [? or Callovian], Asaharbito Beds. Ogar Wein and Golberobe hills, N.E. Kenya ; Oxfordian, Golberobe Beds. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones. Kiwato–Mkange track, 5 miles S.S.E. of Mkange, Bagamoyo hinterland, Tanganyika ; Oxfordian or Kimmeridgian. Tingutitinguti creek and Kindope, both near Tendaguru, Tanganyika ; Upper Kimmeridgian, "*Trigonia smeei*" and *Nerinella* Beds.

Liostrea polymorpha (Münster)

Pl. 9, figs. 3, *7a*, *b*

1833. *Gryphaea polymorpha* Münster, in Goldfuss : 31, pl. 86, figs. *1a*, *b*.
1835. " Unbestimmt "; Roemer, pl. 3, fig. 12.
1843. *Ostrea römeri* Quenstedt : 434.
1857. *Ostrea römeri* Quenstedt ; Quenstedt : 625, pl. 77, figs. 22, 23 (?).
1878. *Ostrea roemeri* Quenstedt ; de Loriol : 165, pl. 23, fig. 4.
1881. *Ostrea roemeri* Quenstedt ; de Loriol : 96, pl. 13, fig. 7.
1917. *Ostrea polymorpha* (Münster) ; Rollier : 592.
1931. *Gryphaea roemeri* (Quenstedt) ; Pchelintsev : 67.

MATERIAL. Three specimens, including nos. LL.35102–03, all *ex* B.P. Coll.

LOCALITY AND HORIZON. Lihimaliao creek, Mandawa area, Tanganyika ; Upper Oxfordian.

REMARKS. *Ostrea roemeri* is included in the synonymy of *Gryphaea polymorpha* on the authority of Rollier and Pchelintsev. *G. polymorpha* has been misinterpreted by a number of authors as the Lower Bajocian species which has been well figured by Benecke (1905 : 162, pl. 11, figs. 1–3) under its correct name *Gryphaea ferruginea* (Terquem). Both forms lie on the border-line between *Liostrea* and *Gryphaea*, the right valve being almost flat and the left valve feebly convex.

The specimens now recorded are subquadrate to suborbicular in outline and the largest was originally about 70 mm. high. Their general shape is, therefore, rather similar to that of the shell figured by de Loriol in 1881 as *Ostrea roemeri*. They are broader than Roemer's figure upon which this latter species was founded and Quenstedt's fig. 22, but in the upper valve of the better preserved specimen (fig. *7b*) the beak is directed posteriorly in much the same manner as in the figures of these authors. This specimen has a relatively large attachment area whereas that of the specimens figured by previous authors is small.

The type specimen of *L. polymorpha* came from the Upper Jurassic (probably Lower Kimmeridgian) of Streitberg, in Franconia. Of the oysters from Cutch, India, described by the present writer (Cox 1952), "*Gryphaea* sp. indet." (pl. 9, figs. *3a–c*) from the Upper Oxfordian seems very close to the specimens now described and could belong to *L. polymorpha*.

Subgenus ***CATINULA*** Rollier 1911

Liostrea (Catinula) alimena (d'Orbigny)

Pl. 9, figs. *6a*, *b*

1840*b*. *Exogyra conica* J. de C. Sowerby, pl. 22, fig. 27 (*non* J. Sowerby sp.).
1850. *Ostrea alimena* d'Orbigny : 343.
1934*b*. *Ostrea* (" *Catinula* ") *alimena* d'Orbigny ; Arkell : 34, pl. 5, figs. 1–15.
1952. *Liostrea* (*Catinula*) *alimena* (d'Orbigny) ; Cox : 76, pl. 6, figs. 7–10.
1960. *Ostrea* (*Catinula*) cf. *ancliffensis* Cox & Arkell ; Joubert, pl. 8, fig. 8.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. 3½ miles W. of Melka Biini, also 11 miles W. of

Rahmu, N.E. Kenya ; Callovian, Rukesa Shales. Kulong, 2 miles S.W. of Muddo Erri, also top of hills S. of Rahmu–Melka Murri road, 10 miles W. of Rahmu, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones. Magindu, Central Railway, and 2 km. to the east, Tanganyika ; Callovian.

REMARKS. The specimens now recorded fall within the range of variation of *L. alimena* as described (Cox 1952) from the Callovian and Oxfordian of Cutch, India. It is difficult to define any difference between this species and *L. ancliffensis* Cox & Arkell (1948 : 20), from the Bathonian, so far as the general form of the shell is concerned, but *L. ancliffensis* does not exceed 11 mm. in height whereas *L. alimena* commonly attains a much larger size. Certainly the numerous small specimens in an oyster bed of which a fragment was figured by Joubert (1960) could not be separated from *L. ancliffensis*, but other specimens from the same formation (the Rukesa Shales) are larger. The radial ribs present in many English specimens referred to this species and described by Arkell (1934*b*) have not been observed in specimens from Cutch or from East Africa.

Genus ***GRYPHAEA*** Lamarck 1801

Gryphaea hennigi Dietrich

Pl. 11, figs. 1*a*, *b*

1900. *Gryphaea lobata* Quenstedt ; Müller : 521, pl. 16, figs. 6, 6*a*.
1925. *Gryphaea hennigi* Dietrich : 6, pl. 2, fig. 4.
1952. *Gryphaea hennigi* Dietrich ; Cox : 83, pl. 8, figs. 7(?), 8, 9*a–c*.

MATERIAL. Three left valves (nos. LL.16848–50).

LOCALITY AND HORIZON. Look-out hill opposite Kingura village, north of Wami river, Tanganyika ; Upper Oxfordian.

REMARKS. The most notable feature of these specimens is the protruding lobe-like antero-ventral region, and in one specimen the growth-rugae show that this was separated from the rest of the valve by a broad sinus of the ventral margin. The specimens are broken away posteriorly, but the largest appears from the growth-rugae to have had a rather similar postero-ventral lobe. They appear to belong to *Gryphaea hennigi*, which, according to Aitken (1961 : 25) is abundant in the Lower Kimmeridgian Septarian Marl of the Mandawa–Mahokondo anticline. They are also extremely close to *G. moondanensis* Cox (1952 : 87, pl. 9, figs. 4, 7, 8), a species from the Tithonian of Cutch, north-western India, in which an antero-ventral lobe is a conspicuous feature.

Genus ***EXOGYRA*** Say 1820

Exogyra nana (J. Sowerby)

Pl. 11, figs. 5, 6*a*, *b*

1822*a*. *Gryphaea nana* J. Sowerby : 114, pl. 383, fig. 3.
1872. *Ostrea bruntrutana* Thurmann ; de Loriol : 399, pl. 24, figs. 7–18.
1929. *Exogyra nana* (J. Sowerby) ; Weir : 20, pl. 1, figs. 11–13.

1930. *Exogyra nana* (J. Sowerby) ; Weir : 85, pl. 10, figs. 27–29.
1952. *Exogyra nana* (J. Sowerby) ; Cox : 92, pl. 10, figs. 2–4.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Ogar Wein and Tifo, N.E. Kenya ; Oxfordian, Golberobe Beds. 2½ miles S.W. of Rahmu, N.E. Kenya ; Oxfordian, Rahmu Shales. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya ; Kimmeridgian, Hereri Shales. Kiwate–Mkange track, 5 miles S.S.E. of Mkange, Bagamoyo hinterland, Tanganyika ; Oxfordian or Kimmeridgian. Kindope valley, near Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. Most of the specimens are irregular in form, but some from the Rahmu Shales are characterized by their regularly lunate outline, recalling that of the larger form *E. fourtaui* Stefanini (see Cox 1935*a* : 174, pl. 17, figs. 14*a*, *b*). Occasional European specimens of *E. nana* (e.g. de Loriol 1872, pl. 24, figs. 12, 12*a*, *b*) are, however, similar in shape.

Superfamily **TRIGONIACEA**

Family ***TRIGONIIDAE*** Lamarck 1819

Genus ***TRIGONIA*** Bruguière 1789

Trigonia costata Parkinson

Pl. 11, figs. 2*a*, *b*

1811. *Trigonia costata* Parkinson : 175, pl. 12, fig. 4.
1875. *Trigonia costata* Sowerby ; Lycett : 147, pl. 29, figs. 5–10.
1932. *Lyriodon costatum* (Sowerby) ; Lebküchner : 101, pl. 15, fig. 9 ; pl. 16, fig. 3.

MATERIAL. One specimen (no. LL.35104), *ex* B.P. Coll.

LOCALITY AND HORIZON. Magole, 5 miles N.W. of Kidugallo, Tanganyika ; Bajocian.

REMARKS. This small specimen, about 18 mm. long and 16 mm. high, appears to be referable to the true *T. costata*, a Bajocian species which has been much misinterpreted. The angular concentric ribs, 16 in number, almost touch the marginal carina in the right valve, but are separated from it in the left by an ante-carinal depression which is fairly narrow, although broader than in the new species *T. kenti*, described below. The posterior area bears a relatively prominent nodose rib the position of which is anterior to median. Between this rib and the marginal carina is a single nodose thread and on its posterior side are three other threads, irregularly arranged. The escutcheon has a few transverse wrinkles. These features are similar to those of English specimens of *T. costata* which have reached the same stage of growth. Previous records of *T. costata* from East Africa are from post-Bajocian beds and are to be rejected.

Trigonia kidugalloensis sp. nov.

Pl. 11, figs. 3*a*, *b*, *c*

Holotype and paratype. Holotype, no. LL.35105 ; one paratype, no. LL. 35106. Both *ex* B.P. Coll.

Diagnosis. Small (length of holotype, when complete, c. 17 mm.), rather strongly inflated, length and height nearly equal, umbones not prominent ; curvature of marginal carina very feeble ; posterior area moderately broad, concave transversely and forming a relatively wide angle with the flank ; ventral margin apparently evenly convex. Flank ornamented with relatively narrow and numerous, evenly curved, round-topped concentric ribs separated by intervals of about the same width ; number of ribs on each valve of holotype 27. Ribs end a short distance from the prominent, serrated marginal carina, which is thus bordered by an ante-carinal groove, slightly wider in left valve than in right. The area has no marked median carina or groove, but bears 6–7 nodose radial threads, and the escutcheon carina is also nodose.

Locality and horizon. 1½ miles N.N.W. of Kidugallo, Tanganyika ; Bajocian.

Remarks. This form resembles the European Bajocian species *T. hemisphaerica* Lycett (re-described Lycett 1877 : 174, pl. 31, figs. 4–8 ; pl. 33, figs. 4–6 (var. *gregaria*)) in the closeness of the spacing of its concentric ribs, but it is less elongate and more strongly inflated, and has a more distinct ante-carinal groove, especially on the left valve. The broader ante-carinal groove and less prominent umbo distinguish the new species from *T. hemisphaerica* race *asiatica* Douvillé (1916 : 29, pl. 4, fig. 9), from the Bajocian of Sinai. In the French Bajocian species *T. gadoisi* Cossmann (1912 : 8, pl. 1, figs. 6–8) the concentric ribs are still more closely arranged.

Trigonia kenti sp. nov.

Pl. 11, figs. 4*a*, *b*, *c*

Specific name. After Dr. P. E. Kent, of the British Petroleum Company, Limited.

Holotype and paratype. Holotype, no. LL.35107 ; one paratype, no. LL. 35108. Both *ex* B.P. Coll.

Diagnosis. Small (length of holotype 22 mm.), moderately inflated, length slightly exceeding height, umbones moderately prominent and acute ; ventral margin tending to be subangular in middle and slightly sinuate posteriorly ; posterior area rather narrow, forming relatively low angle with flank. Flank ornamented with rather angular concentric ribs which are curved irregularly in places and are moderately wide-spaced (about 2 mm. apart) until a relatively late growth-stage, but become crowded together near ventral margin. The ribs extend in both valves almost to the sharp and not strongly nodose marginal carina, the ante-carinal depression being very narrow. Posterior area feebly convex, with a median rib which is most conspicuous in earlier stages of growth and with about four very irregularly spaced radial threads. Escutcheon carina apparently weakly serrated (but eroded in available specimens).

LOCALITY AND HORIZON. 6 miles N.W. of Kidugallo, Tanganyika ; Bajocian.

REMARKS. The crowding together of the concentric ribs near the ventral margin suggests that the two specimens studied, although small, are full-grown representatives of their species. This feature, the irregular curvature of the ribs in places, and the very narrow ante-carinal depression distinguish this species from *T. costata* Parkinson.

Trigonia cf. ***brevicostata*** Kitchin

Pl. 11, fig. 7

1903. Cf. *Trigonia brevicostata* Kitchin : 23, pl. 2, figs. 4, 5.
1939. Cf. *Trigonia brevicostata* Kitchin ; Stefanini : 224, pl. 24, figs. 11, 12.
1952. Cf. *Trigonia brevicostata* Kitchin ; Cox : 112.

MATERIAL. Four imperfect specimens.

LOCALITY AND HORIZON. 1 mile N. of Asaharbito, N.E. Kenya ; Bathonian [? or Callovian], Asaharbito Beds.

REMARKS. The specimens are internal and external moulds of the original shells, the largest of which was originally almost 30 mm. long although the others are much smaller. The ornament consists of well separated, coarse concentric ribs which swing down to some extent and swell out at their posterior end ; they are separated from the marginal carina by a well-marked ante-carinal depression, which appears to be a little wider in the left valve than in the right. The posterior area bears relatively coarse radial threads. These specimens differ from typical examples of *T. brevicostata* in their slightly coarser ribbing (possibly due to their state of preservation) and in the tendency of the ribs to swing down posteriorly, but it is quite possible that they belong to that species. *T. brevicostata* occurs typically in the Callovian of Cutch, India, and has been recorded by Stefanini from beds in southern Somalia which seem to be approximately Callovian in age.

Trigonia elongata J. de C. Sowerby

Pl. 11, fig. 8

1823*a*. *Trigonia elongata* J. de C. Sowerby : 39, pl. 431.
1903. *Trigonia chariensis* Kitchin : 18, pl. 1, fig. 4 ; pl. 2, fig. 1.
1952. *Trigonia elongata* Sowerby ; Cox : 109, pl. 12, figs. 3, 4, 7.

MATERIAL. One specimen (no. LL.35109), *ex* B.P. Coll.

LOCALITY AND HORIZON. About 1½ miles W. of Mandawa, Tanganyika ; Callovian(?).

REMARKS. This specimen does not seem distinguishable from English examples of *T. elongata*, a species discussed by the present writer in the above-cited work, in which specimens from the Callovian of Cutch, India, are described. In England its range extends from the Bathonian to the Oxfordian.

Trigonia migeodi sp. nov.

Pl. 11, figs. 11*a*, *b*

Specific name. After the late F. W. H. Migeod, for some years leader of the British Museum East Africa Expedition.

Diagnosis. Small (length of holotype 17·5 mm.), moderately inflated, length well in excess of height, umbones moderately prominent, marginal carina well curved ; posterior area broad ; ventral margin rather feebly convex, almost straight towards its posterior end. Flank ornamented with relatively narrow and numerous, round-topped concentric ribs separated by intervals of almost the same width ; number on each valve of holotype estimated at about 30 (those on umbonal region worn away). Ribs almost reach carina on right valve. The posterior area has a median groove and bears about 6 radial threads on its antero-ventral side and probably about the same on its postero-dorsal side, where, however, they are not well seen.

Holotype. No. L.51193, a right valve. The only specimen.

Locality and horizon. 1 mile N.W. of Tendaguru hill, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

Remarks. This specimen differs from *T. kidugalloensis* in its more elongate outline, its more strongly curved marginal carina, and its more closely spaced ribs. It is quite close to the European Bajocian species *T. hemisphaerica* Lycett but has more closely spaced ribs. It also much resembles *T. tenuis* Kitchin (1903 : 35, pl. 3, figs. 5, 6), from the Upper Jurassic of India (re-named *T. oomia* by Strand 1928 : 72), but it has more closely spaced ribs and a more conspicuous median groove on its posterior area.

Trigonia dainellii Venzo

Pl. 11, fig. 9

1945. *Trigonia* (*Lyriodon*) *dainellii* Venzo : 15, figs. 1*a–c*.
1949. *Trigonia* (*Lyriodon*) *dainellii* Venzo ; Venzo : 138, pl. 2, figs. 1–5.
1949. *Trigonia* (*Lyriodon*) *brevicostata* Kitchin ; Venzo : 137, pl. 1, figs. 34, 35.
1960. *Trigonia* sp. nov. (*brevicostata* Venzo *non* Kitchin) ; Joubert, pl. 7, figs. 1*a*, *b*.

Material. Several specimens.

Localities and horizon. Odda, and W. slope of hill ½ mile E. of Hafura, both N.E. Kenya ; Uppermost Jurassic or basal Cretaceous, Danissa Beds.

Remarks. The general form and the flank ornament of this species are those of a typical costate *Trigonia*, but there is a tendency for the ribs to undulate irregularly in later stages of growth. A peculiar feature of the specimens now recorded is that the ribs of the flank are continued across the marginal carina, some of them bifurcating at the same time. There is a shallow, linear ante-carinal groove. The posterior area bears two or three strong radial ribs, and in later stages of growth these are crossed by transverse ridges.

The large series of specimens figured by Venzo (1949) as *T. brevicostata* Kitchin and as varieties of his new species *T. dainellii* seem to present all gradations between shells in which the flank ribs continue on to the carina, as in the specimens now recorded, and shells with a smooth ante-carinal area ; this area varies in width and does not always have a well-defined anterior border. In some specimens included by Venzo in the *forma typica* of *T. dainellii* (e.g. his fig. 3) some of the ribs bifurcate on the carina, as in the present specimens.

T. dainellii bears a very close resemblance to the European species which has been well figured by de Loriol (1868 : 160, pl. 10, figs. 12–16 ; pl. 11, fig. 3) under the name *T. truncata* Agassiz. The species in question has a wide range of variation similar to that of *T. dainellii*, and some of its variants have been considered by Munier-Chalmas (1882 : 498–500) to belong to distinct species to which he has assigned names. The specimens from Kenya now recorded are close to de Loriol's pl. 10, figs. 12, 14, re-named by Munier-Chalmas *T. autissiodorensis* and *T. breoni* respectively. The type-specimens of both of these " species " are from the " Portlandian " (probably Upper Kimmeridgian in the British sense) of Auxerre, Yonne, France. It is possible and even probable that *T. dainellii* is synonymous with these European forms, although perhaps not with the true *T. truncata*, a species founded by Agassiz on ill-preserved specimens.

Subgenus ***FRENGUELLIELLA*** Leanza 1942

Trigonia* (*Frenguelliella*) *tealei Cox

Pl. 11, fig. 10

1937*b*. *Trigonia tealei* Cox : 201, pl. 16, figs. 2, 3.

MATERIAL. Several specimens, including the holotype (no. L.54113).

LOCALITIES AND HORIZONS. S. of Tarawanda, 11 miles S.E. of Lugoba, Tanganyika (type-locality) ; Callovian. 2 miles E. of Magindu Station, Central Railway, Tanganyika ; Callovian. Chinamba, $\frac{3}{4}$ mile S. of Amboni quarries, Tanga, Tanganyika ; Callovian? (*ex* B.P. Coll.). Scarp face, eastern margin of Makoko plain, Bagamoyo hinterland, Tanganyika, also Usigiwa river, 6 miles W.S.W. of Kiwanga, Bagamoyo hinterland ; Oxfordian.

REMARKS. The flank ornament of this species resembles that of *T. brevicostata* Kitchin (1903 : 23, pl. 2, figs. 4, 5), from the Callovian of Cutch, India, but the ornament of the posterior area, radial in *T. brevicostata* and transverse in *T. tealei*, enables the two forms to be distinguished.

Subgenus ***INDOTRIGONIA*** Dietrich 1933

Trigonia* (*Indotrigonia*) *smeei auct.

1914. *Trigonia smeei* Sowerby ; Lange : 225, pl. 20, figs. 8–13 ; pl. 21, figs. 1–7.
1933. *Trigonia* (*Indotrigonia*) *smeei* Sowerby ; Dietrich : 30, pl. 3, figs. 48–51, 54–56.

MATERIAL. Very numerous specimens.

LOCALITIES AND HORIZON. Many localities around Tendaguru, Tanganyika ; Upper Kimmeridgian.

REMARKS. The trigoniids of the *T. smeei* group occurring in Tanganyika have recently been treated exhaustively by Aitken (1961), who considers that they belong to at least five species, none identical with the true *T. smeei*, which occurs in the Upper Oxfordian of Cutch, India. The name *T.* (*Indotrigonia*) *africana* is assigned by him (1961 : 75, pl. 8, figs. 2–7 ; pl. 9, figs. 1, 2) to the form most commonly found at Tendaguru.

Trigonia* (*Indotrigonia*) *dietrichi Lange

1914. *Trigonia dietrichi* Lange : 233, pl. 20, fig. 7.
1933. *Trigonia* (*Indotrigonia*) *dietrichi* Lange ; Dietrich : 32, pl. 2, figs. 38–41.

MATERIAL. Two specimens (nos. L.52640, L.52664).

LOCALITY AND HORIZON. Kindope valley, near Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

REMARKS. These specimens, which are imperfect, agree with *T. dietrichi* as figured by Dietrich, and show the strong upward bend of the costae as they approach the marginal carina. This is not a feature indicated in Lange's original figure, but his description refers to a slight upward bend of the costae.

Genus ***MYOPHORELLA*** Bayle 1878

Myophorella quennelli sp. nov.

Pl. 12, figs. 1*a*, *b*

SPECIFIC NAME. After Mr. A. M. Quennell, formerly Director of the Tanganyika Geological Survey, collector of the type specimens.

DIAGNOSIS. Of small-medium size (original length of paratype, the larger specimen, c. 30 mm.), length only slightly in excess of height ; umbo moderately prominent ; anterior and ventral margins forming a broad curve. Marginal carina strongly curved ; posterior area broad, forming a wide angle with the flank, and with an almost vertical posterior margin. Flank ornamented with feebly curved, weakly tuberculate costae which extend to the marginal carina and slope steeply down from it except in the earlier growth-stages, where they are concentric about the umbo. The intervals are about twice the width of the costae except in the posterior corner of the flank, where they are narrower. Two short costae, seen in the holotype but obscured in the paratype, occupy the space near the anterior margin corresponding to the change in the curvature of the main costae. Area without sulcus or radial ribs, but crossed by closely and evenly arranged ridges parallel with posterior margin.

HOLOTYPE AND PARATYPE. Holotype, no. LL.11809 ; one paratype, no. LL.11810. Both are left valves.

Locality and horizon. Just W. of Mabokweni, 4 miles N.W. of Tanga, Tanganyika ; Kimmeridgian.

Remarks. There is no described *Myophorella* with which this species could be confused. In *M. kutchensis* (Kitchin) (1903 : 84, pl. 8, figs. 7–9) the umbo is less prominent and the costae are broken up into irregularly distributed tubercles on the anterior part of the flank.

Myophorella kiwawaensis sp. nov.

Pl. 12, figs. 2*a*, *b*

Diagnosis. Small, ovate, almost orbicular, length (c. 16 mm.) only slightly exceeding height. Umbones not prominent, at anterior third of length. Anterior and ventral margins forming an even curve of strong convexity ; posterior margin relatively long, erect. Marginal carina gently curved, obtusely angular, nodose ; escutcheon carina nodose. Posterior area short, moderately broad, without median groove, and bearing closely arranged transverse threads. Flank with rather delicate nodose costae, those near posterior end straight and vertical, middle ones well curved.

Holotype and paratypes. Holotype, no. LL.35110, also three paratypes, including no. LL.35111 ; all *ex* B.P. Coll.

Locality and horizon. Kiwawa stream, 2400 yards S.E. of Mitekera survey beacon, northern Mandawa area, Tanganyika ; Upper Kimmeridgian.

Remarks. The absence of a radial groove on the posterior area distinguishes this species from young specimens of *Myophorella striata* (Miller) and of related Inferior Oolite species.

Genus ***LAEVITRIGONIA*** Lebküchner 1932

Laevitrigonia dwanikana sp. nov.

Pl. 12, fig. 5

Diagnosis. Shell of medium size (length 35 mm.), ovate, rounded posteriorly ; length not greatly exceeding height. Umbo not prominent, situated at about anterior third of length ; ventral margin strongly and symmetrically convex. Marginal carina an obscure ridge ; posterior area convex, forming a wide angle with the flank ; no ante-carinal depression. Anterior part of flank ornamented with broad, depressed rounded ribs, some split up into irregular nodes by transverse furrows, separated by much narrower intervals. In earlier stages of growth the ribs bend up to the marginal carina, but in later stages they end half-way to the carina, leaving the rest of the flank smooth. Posterior area apparently without ornament (but rather eroded in holotype).

Holotype. No. L.52692 ; the only specimen.

Locality and horizon. Dwanika river, Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

Remarks. This is a very typical *Laevitrigonia*, differing from the type-species, *L. gibbosa* (J. Sowerby), in the absence of an ante-carinal depression, but comparable to some other species from the Upper Jurassic of Europe, for example, *L. acteon* (Munier-Chalmas) (1882 : 503, pl. 12, fig. 5) and *L. oustaleti* (Munier-Chalmas) (1882 : 503, pl. 12, fig. 7). It differs from previously known species in details of ornament.

Genus *RUTITRIGONIA* Van Hoepen 1929

Rutitrigonia stefaninii (Venzo)

Pl. 12, figs. 3*a*, *b*

1942*a*. *Trigonia* (*Laevitrigonia*) *stefaninii* Venzo : 27, fig. 10.
1949. *Trigonia* (*Laevitrigonia*) *stefaninii* Venzo ; Venzo : 145, pl. 2, figs. 28–33 ; also figs. 34–50 (varieties).
1960. *Trigonia stefaninii* Venzo ; Joubert, pl. 7, figs. 2*a*, *b*.

Material. Two specimens (nos. L.92180, L.92273).

Localities and horizon. 3 miles N.E. of Melka Dakacha, N.E. Kenya, and 2 miles S. of Melka Dakacha ; Upper Kimmeridgian, Dakacha Limestones.

Remarks. The better preserved specimen, now figured, is a trigonally ovate shell in which the posterior carina fades away after an early stage of growth and the weak, undulating ribs are confined to the anterior end of the flank. It is closely comparable to some of Venzo's figures. This is obviously a variable species and the numerous varietal names introduced by Venzo seem unnecessary.

This species is of some interest as it appears to belong to the genus *Rutitrigonia*, hitherto known only from Cretaceous rocks. Its umbo is rather more prominent than in the more typical representatives of the genus, but the fading away of its narrow, undulating flank costae on the posterior part of the flank, its smooth posterior area, and its ill-defined marginal carina are exactly as in such species as *R. excentrica* (Parkinson) (figured Lycett, 1875 : 94, pl. 20, figs. 5, 6 ; pl. 21, figs. 6, 7 ; pl. 22, figs. 5, 5*a*) and *R. laeviuscula* (Lycett) (1875 : 96, pl. 22, fig. 6).

Genus *OPISTHOTRIGONIA* Cox 1952

Opisthotrigonia curta (Aitken)

Pl. 12, fig. 4

1961. *Laevitrigonia curta* Aitken : 97, pl. 14, figs. 1–3.

Material. Two specimens (including no. LL.35112), *ex* B.P. Coll.

Locality and horizon. Mpilepile stream, 800 yards E.N.E. of junction of main road and Mahokondo road, Mitole, northern Mandawa area, Tanganyika ; Upper Kimmeridgian.

Remarks. Prior to the publication of Aitken's paper, these specimens had been described in MS. as a new species of *Opisthotrigonia*. One which is 43 mm. long and considerably larger than any of Aitken's specimens is here figured to illustrate the relative size of the depressed ante-carinal space in the right valve. Except in very early growth stages the rather irregular ribs cross this space and terminate at or very close to the blunt marginal carina. The species appears to be more closely related to the typical species of *Opisthotrigonia* than to *Laevitrigonia*.

Superfamily **MODIOMORPHACEA**

Family **HIPPOPODIIDAE** nov.

Genus ***HIPPOPODIUM*** J. Sowerby 1819

Hippopodium quenstedti (Dietrich)

1933. *Epihippopodium quenstedti* Dietrich : 71, pl. 9, fig. 136 ; pl. 10, figs. 142, 143.

MATERIAL. Six specimens.

LOCALITIES AND HORIZONS. 1 mile N.W. of Tendaguru hill, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed. Kindope road, Tingutitinguti creek, and 1½ miles N.N.W. of Tapaira, all near Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

REMARKS. Although Dietrich founded a genus *Epihippopodium* on this species, comparison of his figures showing the internal characters of the shell and of the present specimens with examples of *Hippopodium ponderosum* J. Sowerby, the Lower Liassic type-species of *Hippopodium*, shows such close agreement in all essential characters that the generic separation of the Tendaguru form seems unjustified. *H. quenstedti* differs from *H. ponderosum* only in its larger size and its broader form. It would thus seem that *Hippopodium* lingered on in some remote area after its disappearance from N.W. Europe at the close of the Middle Lias, to reappear almost at the top of the Jurassic in East Africa.

Superfamily **CRASSATELLACEA**

Family **ASTARTIDAE** d'Orbigny 1844

Genus ***ASTARTE*** J. Sowerby 1816

Astarte lurida J. Sowerby

Pl. 12, fig. 8

1816*a*. *Astarte lurida* J. Sowerby : 81, pl. 137, fig. 1.
1836. *Astarte subtetragona* Münster [previously *nom. nud.*] ; Roemer : 113.
1837. *Astarte excavata* Sow. ; Goldfuss : 190, pl. 134, figs. 6*c*, *d* (non *a*, *b*) (*non* J. Sowerby).
1837. *Astarte subcarinata* Münster in Goldfuss : 190, pl. 134, figs. 7*a*, *b*.
1840. *Astarte subtetragona* Münster ; Goldfuss : 304 (Verbesserung, for pl. 134, figs. 6*c*, *d*.).
1842. *Astarte subtetragona* Münster ; Roemer : 13.
1853. *Astarte subtetragona* Münster ; Chapuis & Dewalque : 150, pl. 22, fig. 4.
1869. *Astarte subtetragona* Münster ; Brauns : 226.
1874. *Astarte subtetragona* Münster ; Dumortier : 176, pl. 40, figs. 5, 6.

1874. ?*Astarte lurida* Sow. ; Dumortier : 175, pl. 40, figs. 2–4.
1905. *Astarte elegans* Sow. ; Benecke : 214, pl. 16, figs. 1–3 (*non* J. Sowerby).
1923. *Astarte sublaevis* d'Orbigny ; Ernst : 67, pl. 1, figs. 13*a*, *b* only (*non* d'Orbigny).
1935. *Astarte subtetragona* Münster (with vars. *brevis, krumbecki* and *subcarinata*) ; Kuhn : 123, pl. 8, figs. 39*a*, *b* ; pl. 9, figs. 17*a*, *b*, 20*a*, *b*, 28*a*, *b* ; pl. 10, figs. 20*a*, *b*.

MATERIAL. One specimen (no. LL.35044).

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. Sowerby's holotype of *Astarte lurida* (B.M. (N.H.) no. 43082), from the neighbourhood of Naunton, Gloucestershire, belongs to a widely distributed Upper Liassic species. Abundant specimens from the Cotswold Cephalopod Bed (Yeovilian) illustrate the variability of the species. There is complete intergradation between ovate shells in which the umbo is not terminal and the postero-dorsal and posterior margins meet in a broad curve, and shells with a rectangular to rhomboidal outline in which the umbo is terminal and the margins mentioned meet in a well-defined right or obtuse angle. There is also considerable variation in ornament, some specimens having fairly regular concentric ribs and others irregular rugae. These observations have led to the conclusion that *A. subtetragona*, based on rhomboidal specimens, should be regarded as a synonym of *A. lurida*.

The specimen now recorded is 38·5 mm. long and thus of about the same size as many specimens from the Cotswold Cephalopod Bed. Like the holotype, it is a relatively ovate representative of the species. In England this species ranges from the *bifrons* Zone of the Whitbian stage of the Upper Lias to the *scissum* Zone, near the base of the Inferior Oolite.

Astarte pulfreyi sp. nov.

Pl. 12, figs. 12*a*, *b*, 13

SPECIFIC NAME. After Dr. W. Pulfrey, lately Director of the Kenya Mines and Geological Department.

DIAGNOSIS. Of large-medium size (length of largest specimen c. 33 mm.), suborbicular with a quadrate tendency, length very slightly exceeding height, moderately inequilateral ; inflation weak. Umbones at about anterior third of length, not incurved, directed anteriorly, their outline continuous with postero-dorsal outline, which is feebly convex and gently inclined, joining the feebly convex, subvertical posterior margin in an even curve or forming a rounded-off, obtuse angle with it ; antero-dorsal outline feebly concave near umbo, steeply sloping ; anterior margin rather strongly convex ; ventral margin strongly convex anteriorly, less convex posteriorly, where it forms a rounded-off, obtuse angle with posterior margin. Escutcheon and lunule narrow and shallow, almost absent. No ornament except growth-rugae. Valve-margins denticulate internally.

HOLOTYPE AND PARATYPES. Holotype, no. LL.35027 ; 4 paratypes.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. The hinge-teeth are not seen in any of the specimens but there is little doubt that the species is an *Astarte*. It is more quadrate in outline and less strongly inequilateral than *A. lurida*, recorded above. *A. camertonensis* Moore (1867 : 213, pl. 7, fig. 21), from the Pliensbachian of England, is more elongate.

Astarte didimtuensis sp. nov.

Pl. 12, figs. 10*a*, *b*, *c*, 11*a*, *b*, *c*

DIAGNOSIS. Small (length of largest specimen c. 12·5 mm.), ovate, inequilateral ; height three-quarters to four-fifths of length, beaks from anterior fifth to quarter of length ; inflation moderate. Umbones subangular, not incurved, prosogyrous ; postero-dorsal outline straight, subhorizontal, meeting the strongly convex posterior margin in an even curve which is continued by the strongly convex ventral and anterior margins ; antero-dorsal outline strongly concave. Lunule moderately impressed ; escutcheon narrow and shallow. Ornament consisting of fine, equal concentric riblets which may show slight irregular undulations on posterior part of surface.

HOLOTYPE AND PARATYPES. Holotype, no. LL.35032 ; 9 paratypes.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. *Astarte didimtuensis* is more elongate and has finer concentric ornament than its associated species *A. subminima*, described below. It is quite unlike *A. voltzii* Roemer (1836 : 112, pl. 7, fig. 17), the common small astartid of the European Upper Lias, differing in its more elongate and much more compressed form and in the even distribution and fineness of its concentric threads.

Astarte subminima sp. nov.

Pl. 12, figs. 14*a*, *b*

DIAGNOSIS. Small (length c. 6 mm.), subtrigonal with an orbicular tendency, inequilateral ; height and length almost equal ; beak at about anterior quarter of length ; inflation weak. Umbo sharply rounded in outline, not incurved, slightly prosogyrous ; postero-dorsal outline slightly convex, gently sloping, forming a well-marked, obtuse angle with the rather low, straight, subvertical posterior margin ; ventral margin strongly convex, meeting posterior margin in an ill-defined, obtuse angle ; anterior margin low ; antero-dorsal outline concave, steep. Lunule moderately impressed, no escutcheon. Ornament consisting of fine, equal concentric ribs. Ventral margin denticulate internally.

HOLOTYPE. No. LL.35042. The only specimen.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. This species is rather similar to *Astarte minima* Phillips, from the

Bajocian of Europe, but is more finely ribbed and less rectangular in outline. *A. depressa* Goldfuss, a Bajocian species well figured by Cossmann (1913*a* : 9, pl. 3, figs. 18–27), is more trigonal in outline. *A. gillieroni* Mayer (1875 : 234, pl. 10, fig. 4), Upper Lias of Switzerland, is a larger form with a more strongly prosogyrous umbo.

Astarte sp.

Pl. 12, figs. 15*a*, *b*

MATERIAL. One specimen (no. LL.35043), defective postero-ventrally.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

DESCRIPTION. Small (length when complete c. 7·5 mm.), suborbicular, with a trigonal tendency, inequilateral ; height and length almost equal, beaks at anterior fifth of length ; inflation moderately strong. Umbo rather broadly rounded, well incurved ; postero-dorsal outline moderately convex and sloping, forming a rounded-off, obtuse angle with the low, almost straight, subvertical posterior margin ; ventral margin rather strongly convex ; antero-dorsal outline very feebly concave, steeply sloping ; anterior margin low. Lunule (rather obscured in this single specimen) moderately impressed ; presence of escutcheon doubtful. Ornament consisting of fine, equal concentric riblets.

REMARKS. This form is more gibbose than *A. subminima* and has rather stronger concentric riblets, but the single specimen seems too imperfect to serve as the type of a new species.

Astarte kenti sp. nov.

Pl. 12, figs. 6*a*, *b*, 7*a*, *b*

SPECIFIC NAME. After Dr. P. E. Kent, of the British Petroleum Co., Ltd.

DIAGNOSIS. Small (maximum length c. 15 mm.), trigonally ovate, height two-thirds to three-quarters of length ; inequilateral, beaks from anterior quarter to third of length ; inflation weak. Umbones obtusely angular, not incurved, moderately prominent ; postero-dorsal outline convex, gently sloping, antero-dorsal outline almost straight, steeply sloping ; lunule absent or ill-defined ; escutcheon, if distinguishable, narrow and limited by ill-defined umbonal ridges. Posterior margin feebly convex, varying in height and inclination ; ventral margin flat to feebly convex. Early growth-stages ornamented with regular, close-spaced concentric ridges, later stages with rather irregular concentric undulations and rugae. Valve margins denticulate internally.

HOLOTYPE AND PARATYPES. Holotype, no. LL.35113 ; about 18 paratypes.

LOCALITY AND HORIZON. Near site of Mandawa well no. 1, Tanganyika ; Bajocian(?).

REMARKS. The most closely described Bajocian species is *Astarte hauthali* Wetzel (1911 : 249, pl. 20, figs. 19, 20), which is slightly more rectangular.

Astarte pindiroensis sp. nov.

Pl. 13, figs. 4*a*, *b*, 5*a*, *b*

Diagnosis. Small (length of holotype 5·5 mm ; of largest paratype 11 mm.), rectangularly ovate, height from four-fifths to five-sixths of length, inflation moderate. Inequilateral, umbones situated from anterior quarter to third of length, scarcely incurved, directed anteriorly, their outline continuous with the feebly convex, gently sloping to sub-horizontal postero-dorsal outline of the shell, which merges in a broad curve with the feebly convex, only slightly oblique posterior margin ; ventral margin moderately convex, forming a rounded-off, obtuse angle with posterior margin and merging in an even curve with the broadly convex anterior margin ; concavity of antero-dorsal outline confined to neighbourhood of beak. No diagonal ridge. Escutcheon very narrow, bordered by blunt umbonal ridges ; lunule an unimpressed cordiform area limited by faint striae. Ornament consisting of fine concentric threads, slightly unequal and irregularly arranged in places.

Holotype and paratypes. Holotype, no. LL.35206, figured paratype, no. LL.35207, both extracted from a piece of limestone containing a large number of other paratypes.

Locality and horizon. Tributary of Namakumbira stream, 1 mile S.E. of Nkomore, Mandawa-Mahokondo area, Tanganyika ; Bajocian (?), Pindiro Shales.

Remarks. This species is smaller and less trigonal than *A. kenti*, described above. Its very fine ornament distinguishes it from the European Bajocian form *A. minima* Phillips.

Astarte ayersi sp. nov.

Pl. 13, figs. 7*a*, *b*

Specific name. After Mr. F. M. Ayers, of the Kenya Geological Survey.

Diagnosis. Rather small (length of holotype 15 mm.), triangularly subovate, slightly longer than high, evenly and fairly strongly inflated. Umbo prominent, narrowly rounded in outline, placed at about anterior third of length. Antero-dorsal outline slightly convex, sloping gently, and forming a rounded-off, obtuse angle with posterior margin ; posterior, ventral and anterior margins forming an even curve which is almost a semicircle : antero-dorsal outline strongly excavated. Ornament consisting of narrow, evenly spaced concentric ridges about 0·75 mm. apart in later growth-stages.

Holotype and paratypes. Holotype, no. L.83876 ; numerous paratypes, mainly imperfect.

Locality and horizon. 1 mile N. of Asaharbito, N.E. Kenya ; Bathonian [? or Callovian], Asaharbito Beds.

Remarks. This species bears some resemblance to the European Bathonian species *Astarte oolitharum* Cossmann (1925 : 663, pl. 22, figs. 14, 15) (= *A. depressa* Morris & Lycett 1855, pl. 9, fig. 11, *non* Goldfuss), but is considerably larger. The species *Astarte daphne* de Loriol (1891 : 244, pl. 26, figs. 25–27), Upper Oxfordian of Switzerland, is comparable in size and shape, but its concentric ribs are more closely spaced.

Astarte muelleri Dacqué

1900. *Astarte* sp ; Müller : 534, pl. 17, fig. 7.
1910. *Astarte mülleri* Dacqué : 31, pl. 4, fig. 5.
1937*b*. *Astarte mülleri* Dacqué ; Cox : 202.

MATERIAL. One specimen (no. L.54117).

LOCALITIES AND HORIZONS. 2 miles E. of Magindu Station, Central Railway, Tanganyika ; Callovian. Müller's original specimen came from a locality 1·5 km. W. of the Mahokondo stream, 24·5 km. N.W. of Kiswere, where the beds are now thought to be Callovian in age.

Astarte aitkeni sp. nov.

Pl. 12, figs. 9*a*, *b*, *c*

SPECIFIC NAME. After Dr. W. G. Aitken, lately Director of the Geological Survey of Nyasaland, collector of the holotype.

DIAGNOSIS. Rather small (length of holotype 12 mm.), trigonally orbicular, slightly higher than long, compressed, early growth-stages flattened. Umbones just anterior to median, obtusely angular. Postero-dorsal outline strongly convex, steep, meeting almost semicircular ventral margin in an ill-defined angle ; anterior outline very feebly convex, steep. Escutcheon narrow, no lunule. Surface, up to mid-growth, bearing obtusely angular ridges, widely separated except near umbo, the last two 3 mm. apart ; later growth-stages bearing only rather fine concentric threads.

HOLOTYPE. No. LL.35189. The only specimen.

LOCALITY AND HORIZON. Nchia stream, 2 miles W.N.W. of Mandawa, Tanganyika ; Callovian.

REMARKS. This species differs from *A. huralensis* Stefanini, recorded below (p. 89), in its taller form, in the wider spacing of its obtuse concentric ridges, and in the absence of such ridges in later stages of growth.

Astarte unilateralis J. de C. Sowerby

Pl. 14, figs. 2, 3

1840*b*. *Astarte unilateralis* J. de C. Sowerby : 327, pl. 21, fig. 14.
1863. *Astarte hermanni* Oppel : 272.
1865. *Astarte unilateralis* Sow. ; Salter *in* Strachey : 97, pl. 23, fig. 10.
1913. *Astarte hermanni* Oppel ; Holdhaus : 440, pl. 99, figs. 7–11, 14.

MATERIAL. Two specimens (nos. LL.35118–19), *ex* B.P. Coll.

LOCALITY AND HORIZON. Lonji creek, W. of Mandawa, Tanganyika ; Callovian?

REMARKS. Specimens of this species from the Spiti Shales were described very fully by Holdhaus, but it is not clear why he preferred Oppel's specific name to the earlier one of Sowerby. Sowerby's type and the specimen from the Spiti Shales figured by Salter are both in the British Museum (Natural History), where there are also numerous topotypes from Cutch. The species is characterized by its strongly inequilateral cuneiform shape and its strongly convex postero-dorsal outline, which in many specimens rises appreciably above the umbo before beginning to slope steeply downwards to join the low posterior margin in an uninterrupted curve. The earlier growth stages are ornamented with well separated, regular, angular concentric folds, which later are replaced by irregular rugae. This is the first record of the species from East Africa. The specimens recorded are up to about 44 mm. long and quite typical as regards shape and ornament.

In Cutch this species occurs most commonly in the Callovian *athleta* Beds and Oxfordian Dhosa Oolite. Ill-preserved specimens which appear to be referable to it occur in the Callovian Chari beds and also in the Upper Oxfordian.

Astarte sowerbyana Holdhaus

Pl. 13, figs. 6*a*, *b*

1840*c*. *Astarte major* J. de C. Sowerby, pl. 61, fig. 1 and explan. (*non Astarte elegans major* Zieten).

1913. *Astarte sowerbyana* Holdhaus : 443, pl. 99, figs. 12, 13, 15 ; pl. 100, fig. 1.

1933. *Astarte krenkeli* Dietrich : 40, pl. 4, figs. 62, 64, 66.

MATERIAL. Three specimens (including nos. L.52688, LL.35120), partly *ex* B.P. Coll.

LOCALITIES AND HORIZONS. Lihimaliao creek, Mandawa area, Tanganyika ; Upper Oxfordian. N. of Kipande, also 1 mile N.W. of Tendaguru hill, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. This species differs from *A. unilateralis* in its more ovate outline and larger size, although the difference in size is not so marked in the specimens from the Spiti Shales described by Holdhaus as in those from India and East Africa. In the African specimens, as in those from India, there is some variation in the relative elongation of the shell. Sowerby's type specimen of *A. major*, which is in the British Museum (Natural History), is a relatively elongate shell and very similar to Dietrich's type of *A. krenkeli*: It is strange that Dietrich made no reference to Sowerby's species. In early stages of growth *A. sowerbyana*, like *A. unilateralis*, bears concentric folds. In later stages these are replaced by rather distant concentric undulations in some specimens and by irregular corrugations in others.

In Cutch this species occurs at several localities in the Upper Oxfordian (Argovian) *Astarte* Bed, and it reappears in the Tithonian of Moondan and elsewhere.

Astarte episcopalis de Loriol

1897. *Astarte duboisi* d'Orbigny ; de Loriol : 88, pl. 12, fig. 13 (*non* d'Orbigny).

1901. *Astarte episcopalis* de Loriol : 72, pl. 5, figs. 1, 2.

MATERIAL. Four specimens (nos. LL.16837–40).

LOCALITY AND HORIZON. Usigiwa river, 6 miles W.S.W. of Kiwangwa, Bagamoyo hinterland, Tanganyika ; Upper Oxfordian.

REMARKS. The length of the largest specimen referred to this species is 72 mm. The shell is ovate, with the height equal to about three-quarters of the length, and is strongly inequilateral and of moderate and even convexity. The umbo is slightly obtuse and not quite terminal. The postero-dorsal outline is of moderate convexity, rising at first to a level slightly above that of the umbo, and then sloping down to form a rounded-off, obtuse angle with the slightly oblique and flattened posterior margin ; the antero-dorsal outline is scarcely excavated. The ventral and antero-ventral margins are of strong convexity. The lunule is shallow and there is no escutcheon. The surface bears concentric undulations, which are regular in early stages of growth, but later become very irregular.

The African specimens do not appear to differ in any features of importance from *A. episcopalis* which occurs typically in the " Middle Oxfordian " of the Bernese Jura. Of the other species now recorded from East Africa, *A. muelleri* Dacqué is more trigonal in outline. *A. subobovata* Dietrich is more rounded posteriorly and less elongate, *A. recki* Dietrich has a more strongly convex postero-dorsal outline, and *A. mitoleensis* sp. nov. is more elongate and tapers more towards its posterior end.

Astarte huralensis Stefanini
Pl. 15, fig. 1

1939. *Astarte huralensis* Stefanini : 234, pl. 24, figs. 19, 20*a–c*.
1960. *Astarte* sp. nov. ; Joubert, pl. 9, figs. 4*a*, *b*.

MATERIAL. Numerous specimens (nos. L.92123, L.92236–39), preserved on the surface of blocks of limestone.

LOCALITY AND HORIZON. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones.

REMARKS. The specimens now recorded agree well in size and ornament with Stefanini's figures, which do not, unfortunately, show the outline of the shell very clearly. The Kenya specimens are up to about 9 mm. in length, rectangularly ovate to subtrigonal, with the length slightly exceeding the height, and not strongly inflated. The umbo, which is obtusely angular and not incurved, is not quite terminal, the anterior margin of the shell projecting slightly beyond it. The dorsal margin is convex, meeting the nearly straight and vertical posterior margin in a rounded-off, obtuse angle. The ventral margin is strongly convex and the antero-dorsal outline is moderately excavated below the beak. The ornament consists of relatively wide-spaced, obtusely angular concentric ridges, the crests of which are about 1·8 mm. apart ; no subordinate threads are present.

The most closely comparable European species appears to be *Astarte cingulata* Contejean (1860 : 267, pl. 11, figs. 5–10), from the Kimmeridgian, in which the outline of the shell is more trigonal. *A. huralensis* was described originally from the " Oolitico medio " (? Oxfordian) of southern Somalia.

Astarte mandawaensis sp. nov.

Pl. 14, figs. 6*a*, *b*

Diagnosis. Of medium size (length of holotype 38 mm.), ovate, rather strongly inequilateral, length exceeding height, beak at anterior third of length ; shell well inflated for the genus. Umbo obtusely angular, depressed, slightly incurved to prosogyrous beak. Postero-dorsal outline rather strongly convex, level with umbo anteriorly, down-curved posteriorly, where it forms an obtuse angle with the somewhat flattened posterior margin ; ventral and anterior margins forming an uninterrupted curve of strong convexity ; antero-dorsal outline strongly concave. Lunule broad, flattened and deep, bordered by well-defined ridge ; escutcheon narrow. Ornament of irregular concentric undulations which are broad and relatively few on anterior two-thirds of surface but increase in number by intercalation or bifurcation on posterior part, where they are consequently of diminished width.

Anterior cardinal tooth of left valve stout and prominent, sloping back from beak and separated by narrow space from lunular margin ; posterior cardinal tooth elongate, slightly curved, forming very acute angle with ligamental nymph.

Holotype. No. LL.35121, *ex* B.P. Coll. The only specimen.

Locality and horizon. Lonji creek, W. of Mandawa, Tanganyika ; Upper Kimmeridgian.

Remarks. Although the postero-ventral part of the holotype is broken away, the well inflated, ovate form of the shell is very distinctive for an astartid, while the ornament is also characteristic. It differs from the approximately contemporaneous East African species *A. weissermeli* Dietrich, recorded below (p. 92), in its more elongate outline, its broader and more unevenly arranged concentric undulations, and its deep, distinctly bordered lunule.

Astarte lonjiensis sp. nov.

Pl. 14, fig. 1

Diagnosis. Large (length of holotype 74 mm.), ovate with slight trigonal tendency, highly inequilateral, height six-sevenths of length ; inflation rather weak. Umbo almost terminal, slightly incurved, rather sharply rounded in outline ; postero-dorsal outline continuous with that of umbo, at first convex and rising very slightly above level of latter, but almost straight and sloping gently downwards along greater part of length ; it forms a slightly obtuse angle with the short, straight, subvertical posterior margin. Antero-dorsal outline steep, slightly concave ; ventral margin very strongly convex. Lunule narrow, moderately excavated ; no escutcheon. Early growth-stages ornamented with regular, rather closely spaced concentric ribs, which in later stages are replaced by coarse, irregular rugae. Interior not exposed.

Holotype. No. LL.35122, *ex* B.P. Coll. The only specimen.

Locality and horizon. Lonji creek, W. of Mandawa, Tanganyika ; Upper Kimmeridgian.

REMARKS. This species is less tumid than *A. sowerbyana*, has a more strongly convex ventral margin, and is more closely ribbed on its umbonal region. It is less orbicular in shape than *A. recki* Dietrich, which is abundant in the Upper Jurassic at Tendaguru.

Astarte subobovata Dietrich

Pl. 15, fig. 4

1933. *Astarte subobovata* Dietrich : 40, pl. 5, figs. 68, 74 ; pl. 9, fig. 141.

MATERIAL. One specimen (no. L.52683).

LOCALITY AND HORIZON. Maimbwi river, Tendaguru, Tanganyika ; Upper Kimmeridgian, "*Trigonia smeei*" Bed.

REMARKS. Dietrich's two figured syntypes showing the exterior of the shell (pl. 5, fig. 68 ; pl. 9, fig. 141) differ considerably in shape. A study of the figures suggests, however, that the distinction between this species and the closely comparable species *A. recki* lies mainly in the broadness of the concentric folds on the main part of the surface, which rather resemble those of a *Cardinia*. Other points of distinction are the less strongly convex postero-dorsal margin and the stronger inflation of the shell, especially in the umbonal region. On the basis of such differences, a single specimen in the material studied is assigned to *A. subobovata*.

It is not clear why Dietrich not only commented on the similarity between this species and the Lower Cretaceous species *A. obovata* J. de C. Sowerby but also assigned a specific name to it suggesting affinity with the form in question. In *A. obovata* the concentric folds on the main part of the surface of the shell are of much smaller amplitude than in *A. subobovata* and not in the least reminiscent of those of a *Cardinia*.

Astarte recki Dietrich

Pl. 14, figs. 4, 5

1933. *Astarte recki* Dietrich : 40, pl. 4, fig. 60 ; pl. 5, figs. 69–71.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Several localities around Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* and "*Trigonia smeei*" Beds.

REMARKS. A particular characteristic of this large species is the broad convexity (almost an obtuse angularity) of the anterior part of the postero-dorsal margin, which rises well above the level of the beak. The length of the shell exceeds the height very slightly and the anterior margin projects beyond the beak to a variable extent, but usually not very much. In most specimens the posterior margin is a little flattened, but in some it is convex and merges with the ventral margin in an even curve. Up to a height of 25 mm. the shell bears closely and regularly spaced concentric ridges, but in later growth-stages these are replaced by irregular rugae and corrugations. The length of the largest specimen examined is about 90 mm.

Astarte weissermeli Dietrich

Pl. 13, figs. 2, 3

1933. *Astarte weissermeli* Dietrich : 41, pl. 6, figs. 75–80.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Nitongola creek, Maimbwi river, Kindope valley, and $\frac{3}{4}$ mile S. of Nautope, all Tendaguru district, Tanganyika ; Upper Kimmeridgian, "*Trigonia smeei*" Bed. Mpilepile stream, 800 yards E.N.E. of junction of main road and Mahokondo road, Mitole, northern Mandawa area, Tanganyika ; Upper Kimmeridgian.

REMARKS. This is a fairly strongly and evenly inflated, suborbicular species with a rather prominent umbo situated at about the anterior third of the length of the shell and with ornament of strong, irregular concentric corrugations. The largest specimen in the material studied is about 30 mm. high.

Astarte mitoleensis sp. nov.

Pl. 13, fig. 1

DIAGNOSIS. Large (length of holotype 74 mm.), ovate, height four-fifths of length, strongly inequilateral ; inflation moderate. Umbo not quite terminal, incurved, convexly subangular in outline ; postero-dorsal outline strongly convex, rising at first well above umbo and then curving down to form a rounded-off, obtuse angle with the rather low, almost straight, vertical posterior margin. Antero-dorsal outline strongly excavated ; ventral and antero-ventral margins of moderately strong convexity. Lunule well excavated ; no escutcheon. Median part of flank flattened ventrally. Ornament consisting of very irregular concentric undulations and rugae, not more evenly arranged in early than in later growth-stages.

HOLOTYPE. No. LL.35123, *ex* B.P. Coll. The only specimen.

LOCALITY AND HORIZON. Mpilepile stream, 1300 yards E.N.E. of Mitole road junction, northern Mandawa area, Tanganyika ; Upper Kimmeridgian.

REMARKS. This species differs from *Astarte stuhlmanni* (Müller), Neocomian, Tanganyika, and from *A. subobovata* Dietrich, Upper Kimmeridgian, Tanganyika, in its less inflated form, its more strongly excavated antero-dorsal outline, and its flat posterior margin. Compared with *A. episcopalis* de Loriol, it is higher at its posterior end and less elongate. It very closely resembles the European Aptian species *Astarte obovata* J. Sowerby.

Subgenus ***LECKHAMPTONIA*** Cox & Arkell 1948

Astarte (Leckhamptonia) hobleyi sp. nov.

Pl. 15, figs. 2*a*, *b*

SPECIFIC NAME. After the late C. W. Hobley, a pioneer in the investigation of the geology of Kenya.

DIAGNOSIS. Of medium size (length of larger specimen c. 30 mm.), rectangular, height two-thirds of length, beaks at about anterior third of length ; inflation slight. Umbo very broad, not incurved ; postero-dorsal outline straight, horizontal, forming a slightly obtuse angle with the straight or feebly convex posterior margin ; ventral margin straight, parallel with postero-dorsal outline ; antero-dorsal outline very slightly concave, gently inclined ; anterior margin of feeble convexity. Ornament consisting of almost equidistant, well separated, erect lamellae, with fine growth-threads in their intervals.

HOLOTYPE AND PARATYPE. Holotype, no. LL.35045. One paratype only, no. LL.35046.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. This species seems closely related to *Astarte* (*Leckhamptonia*) *interlineata* Morris & Lycett, of the Bajocian and Bathonian of England, but it is much larger. It bears some resemblance to the internal mould from the Upper Lias of Germany figured by Roemer (1836 : 120, pl. 8, fig. 3) as "*Corbis laevis* Sow.? " and re-named *Astarte sublaevis* by d'Orbigny.

Genus ***COELASTARTE*** Boehm 1893

Coelastarte dietrichi sp. nov.

1933. *Astarte* (*Coelastarte*) cf. *cotteausia* (d'Orb.) de Loriol ; Dietrich : 42, pl. 4, fig. 61 (*non A. cotteausia* d'Orbigny).

DIAGNOSIS. Shell of medium size (length of holotype c. 40 mm.), rectangularly ovate, well elongated (length to height ratio 5 : 3), compressed. Beaks at about anterior fifth of length, pointed, directed downward to some extent, with convex dorsal margin rising above them ; antero-dorsal outline concave. Posterior margin rounded except in earlier stages of growth, ventral margin flattened. Concentric undulations strong and regular in earlier stages of growth, bending upward in a well-defined angle posteriorly, irregularly spaced and rather weaker in later growth-stages.

HOLOTYPE AND PARATYPE. The specimen figured by Dietrich, which it has not been possible to examine, is designated as holotype. One specimen (no. L.52113) in the material examined is the only paratype.

LOCALITY AND HORIZON. Nitongola creek, Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed. The holotype came from the same horizon in the bed of the Maimbwi river, Tendaguru.

REMARKS. This species was considered by Dietrich to be closely comparable to *Astarte cotteausia* d'Orbigny as figured by de Loriol (1875 : 100, pl. 15, fig. 42) from the Lower Kimmeridgian of France, but it is more elongated and has a more pronounced convexity of the antero-dorsal outline. According to Cottreau (1929 : 101), d'Orbigny's holotype of *A. cotteausia* is too ill-preserved to be worth figuring. *Astarte rzehaki* Boehm (1883 : 558, pl. 62, fig. 33), Tithonian of Moravia, is higher at its posterior extremity. Although species of *Coelastarte* are well known to be variable, it seems desirable to regard the East African form as a separate species.

Genus ***PRAECONIA*** Stoliczka 1871

Praeconia rhomboidalis (Phillips)

1829. *Isocardia rhomboidalis* Phillips : 128, pl. 3, fig. 28.
1934*a*. *Praeconia rhomboidalis* (Phillips) ; Arkell : 251, pl. 33, figs. 14, 15.
1948. *Praeconia rhomboidalis* (Phillips) ; Cox & Arkell : 28.

MATERIAL. One specimen (no. LL.35124), *ex* B.P. Coll.

LOCALITY AND HORIZON. Hill-top N. of Lugoba on road to Msata, Tanganyika ; Callovian(?).

REMARKS. This specimen consists only of the posterior half of one valve, but is an unmistakable representative of the species, the geological range of which in Europe is from Bajocian to Oxfordian.

Genus ***SEEBACHIA*** Holub & Neumayr 1882

Seebachia janenschi Dietrich

1933. *Seebachia janenschi* Dietrich : 43, pl. 4, figs. 57, 63, 64 ; pl. 5, figs. 67, 73.

MATERIAL. Two specimens (including no. LL.35125), *ex* B.P. Coll.

LOCALITY AND HORIZON. Mpilepile stream, 800 yards E.N.E. of junction of main road and Mahokondo road, Mitole, northern Mandawa area, Tanganyika ; Upper Kimmeridgian.

REMARKS. These specimens, which are preserved in a coarse conglomerate, are eroded, but have the unmistakable outline of *B. janenschi*. The larger is 52 mm. long. The type locality of the species is Tendaguru, where it occurs in the " *Trigonia smeei* " Bed.

Superfamily **LUCINACEA**

Family **LUCINIDAE** Fleming 1828

Genus ***LUCINA*** Bruguière 1787

Lucina sp.

Pl. 15, figs. 5*a*, *b*

MATERIAL. Four internal moulds (nos. LL.35047–50).

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

DESCRIPTION. Of medium size (length of largest specimen c. 22 mm.), suborbicular with a hexagonal tendency, length and height almost equal, umbones angular, prosogyrous, at about anterior third of length ; inflation weak ; postero-dorsal region compressed, limited in each valve by a strongly curved ridge running from the umbo to the postero-ventral corner.

REMARKS. This lucinid is not referable to any species recorded from the Upper Lias of Europe, but the available specimens are too imperfect to serve as type material of a new species. The species is smaller and less rectangular than *Lucina plana* Zieten, in which, moreover, there is no compressed postero-dorsal area. The presence of this area also distinguishes it from the Bajocian species *L. despecta* Phillips, recorded below.

Lucina despecta Phillips

Pl. 15, fig. 9

1829. *Lucina despecta* Phillips : 150, pl. 9, fig. 8.

MATERIAL. Numerous specimens, all in the form of moulds, on the surface of which traces of the original surface ornament are impressed.

LOCALITIES AND HORIZON. Kidugallo Station and 1¼ miles E. of Kidugallo Station, Central Railway, Tanganyika ; Bajocian, Station Beds.

REMARKS. The specimens are slightly longer than high, with the umbo broadly rounded, moderately prominent, and placed at about the posterior two-fifths of the length ; the length of a typical specimen is 18·5 mm. The gently sloping postero-dorsal outline forms a well-defined, obtuse angle with the nearly straight and vertical posterior margin. The anterior margin is feebly convex and prosocline in its general direction, joining the antero-dorsal margin in a broad curve. The surface is ornamented with concentric ridges which are about 1 mm. apart on the middle of the shell in the best-preserved specimen, with concentric threads in their intervals. Impressions of anterior and posterior lateral teeth are preserved.

Lucina despecta, the holotype of which came from the Inferior Oolite of Yorkshire, has been misinterpreted by many authors and the name has been applied to specimens from later geological formations differing considerably from those from the type-horizon. No satisfactory figure of the species, in fact, exists in the literature, the original one of Phillips being a little foreshortened. The East African specimens now recorded have been compared with specimens of *L. despecta* from Yorkshire, and I can see no reason for separating them specifically from the English species. *Lucina paradoxa* Waagen (1867 : 621, pl. 31, figs. 5*a*, *b*), from the Inferior Oolite of Germany, seems very close to *L. despecta*, although a little more elongate.

Lucina cf. ***lirata*** Phillips

References to descriptions of the typical *L. lirata* are as follows :

1829. *Lucina lirata* Phillips : 140, pl. 6, fig. 11.
1934*a*. *Lucina lirata* Phillips ; Arkell : 278, pl. 41, figs. 1–3, 7.

The form now recorded has been illustrated as follows :

1960. *Lucina* sp. : Joubert, pl. 9, figs. 6*a*, *b*.

MATERIAL. One specimen (no. L.92095).

LOCALITY AND HORIZON. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

REMARKS. The fossil now recorded is an ill-preserved specimen of a well-inflated, moderately large, suborbicular *Lucina*, the length and height of which were originally just over 40 mm. It is of much the same size and shape as typical specimens of *L. lirata* from the Lower Oxfordian of England, but its well-marked and fairly evenly spaced concentric ridges are only about 0·75 mm. apart, whereas in specimens of *L. lirata* from the type-locality the corresponding distance is 1–1·5 mm.

Lucina cutleri sp. nov.

Pl. 15, figs. 3*a*, *b*

SPECIFIC NAME. After the late W. E. Cutler, the first leader of the British Museum East Africa Expedition.

DIAGNOSIS. Shell small (length 12 mm.), oval, only slightly longer than high, feebly inflated. Umbo very broadly rounded, placed at anterior two-fifths of length, level with feebly convex postero-dorsal margin, which makes a fairly well-defined, obtuse angle with the posterior margin. Posterior margin a little flattened, but merging in an even curve with the strongly convex ventral margin, which is also continuous with the anterior margin. Antero-dorsal margin straight, visible in side-view of shell, sloping gently, and merging in a broad curve with the anterior margin. No lunule or escutcheon. Ornament consisting of narrow concentric ridges about one-third mm. apart in later growth-stages and separated by flat, smooth intervals ; ridges absent from antero-dorsal region, where margin is bordered by narrow, smooth area.

HOLOTYPE. No. L.52141. The only specimen.

LOCALITY AND HORIZON. Lilomba creek, Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

REMARKS. In shape this species is rather like *Lucina cardinalis* Contejean (1860 : 327, pl. 21, figs. 14, 15), from the Kimmeridgian of France, but it is very much smaller. In *L. tarichensis* de Loriol (1895 : 33, pl. 5, figs. 5, 6), from the Oxfordian of Switzerland, another much larger species, the antero-dorsal outline of the shell is more excavated.

Family **UNICARDIIDAE** Fischer, 1887

Genus ***MACTROMYA*** Agassiz 1843

Mactromya eamesi sp. nov.

Pl. 15, figs. 8*a*, *b*, *c*

SPECIFIC NAME. After Dr. F. E. Eames, Chief Palaeontologist of the British Petroleum Co., Ltd.

DIAGNOSIS. Small for genus (length 17 mm.), elongate-ovate, slightly inequilateral, height less than two-thirds of length, beaks at anterior two-fifths of length ; inflation moderate for genus. Umbones very broadly rounded, well incurved to slightly prosogyrous beaks, and projecting a little above antero-dorsal outline, which slopes gently and meets the feebly convex posterior margin in a broad curve ; ventral margin of very feebly convexity, symmetrical ; anterior margin of feeble convexity, not much shorter than posterior margin ; antero-dorsal outline feebly concave, scarcely sloping. Ornament consisting of irregular concentric ribs and rugae.

HOLOTYPE. No. LL.35127, *ex* B.P. Coll. No other material has been examined.

LOCALITY AND HORIZON. Near site of Mandawa well no. 1, Tanganyika ; Bajocian(?).

REMARKS. This shell is even more elongate than *Mactromya aequalis* Agassiz (1843 : 196, pl. 9*d*, figs. 5–8), a species of Bathonian-Callovian age, and is also more strongly inflated.

Mactromya aequalis Agassiz

Pl. 15, fig. 7

1843. *Mactromya aequalis* Agassiz : 196, pl. 9*d*, figs. 5–8.
1912. *Mactromya aequalis* Agassiz ; Lissajous : 97, pl. 12, fig. 11.
1915*b*. *Arcomya bicorrugata* Cossmann : 12, pl. 1, fig. 5 ; pl. 2, figs. 9–11 ; pl. 3, figs. 14–16.
1929. *Mactromya rugosa* auct. ; Weir, 34, pl. 3, figs. 16, 17 (*non* 18) (*non* Roemer).
1935*a*. *Mactromya aequalis* Agassiz ; Cox : 183, pl. 19, figs. 16, 17*a*, *b*.
1939. *Mactromya aequalis* Agassiz ; Stefanini : 259, pl. 27, fig. 1.
1960. *Mactromya aequalis* Agassiz ; Joubert, pl. 10, figs. 7*a*, *b*.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. 3½ miles W. of Melka Biini, N.E. Kenya ; Callovian, Rukesa Shales. 14 miles W.S.W. of Rahmu, also Muddo Erri and Kulong, 2 miles S.W. of Muddo Erri, all N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

REMARKS. These poorly preserved specimens are similar to those from British Somaliland which I figured in 1935. They are characterized by the irregularity of their concentric ridges and corrugations.

Mactromya quadrata (Roemer)

Pl. 15, figs. 11*a*, *b*

1836. *Mya rugosa* Roemer : 125, pl. 9, figs. 16, 17 (*non* Gmelin).
1836. *Mya quadrata* Roemer : 126.
1840. *Lutraria concentrica* Münster *in* Goldfuss : 258, pl. 153, figs. 5*a*, *b*.
1843. *Mactromya rugosa* (Roemer) ; Agassiz : 197, pl. 9*c*, figs. 1–23.
1872. *Lucina rugosa* (Roemer) ; de Loriol : 266, pl. 16, fig. 1.
1912. *Mactromya rugosa* (Roemer) ; Lissajous : 97, pl. 12, fig. 12.

MATERIAL. Four specimens.

LOCALITIES AND HORIZONS. Kailta, Golberobe hills, N.E. Kenya ; Oxfordian, Golberobe Beds. 17 miles S. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones. 3 miles N.E. of Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones. Just W. of Mabokweni, 4 miles N.W. of Tanga, Tanganyika ; Kimmeridgian.

Remarks. This species, like *M. aequalis*, from which it scarcely differs, is characterized by its rather elongate outline and by the irregularity of its concentric ridges, which very commonly are undulating in places.

Family **FIMBRIIDAE** Nicol 1950

Genus ***FIMBRIA*** Mergele von Mühlfeld 1811

Fimbria kidugalloensis sp. nov.

Pl. 16, figs. 1*a*, *b*

Diagnosis. Shell of small-medium size (length 32 mm.), elongate, rather weakly inflated. Umbones subangular, slightly anterior to median, protruding above postero-dorsal outline, which is straight, sloping gently to low posterior extremity of shell. Ventral margin of very feeble convexity ; antero-dorsal outline well excavated ; anterior margin evenly rounded. Ornament consisting of closely and rather unevenly spaced, thin concentric ridges, typically about 0·4 mm. apart in later growth-stages ; many intervals between them bear one or more weak concentric threads, together with traces of radial threads.

Holotype. No. L.54103. The only specimen.

Locality and horizon. 1¼ miles E. of Kidugallo Station, Central Railway, Tanganyika ; Bajocian, Station Beds.

Remarks. The genus *Fimbria* is rare in the Bajocian. The species now described is characterized by the fineness and close spacing of its concentric ridges. *F. aspera* (Lycett) (1850 : 423, pl. 11, fig. 7), from the English Inferior Oolite, is much more coarsely ornamented. The Kimmeridgian species *F. formosa* (Contejean) (1860 : 275, pl. 13, figs. 1–3) has equally fine concentric ornament but is less elongate.

Fimbria sp. " A "

Pl. 15, fig. 6

Material. Several specimens.

Localities and horizons. Hills S. of Rahmu–Melka Murri road at localities 11 miles and 13 miles W. of Rahmu, N.E. Kenya ; Callovian, Rukesa Shales. Hills S. of Rahmu–Melka Murri road at locality 9 miles W. of Rahmu ; also Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Remarks. Two species of *Fimbria* which occur in the Rukesa Shales and Muddo Erri Limestones are represented in the material studied only by specimens which are incomplete, much eroded, or in the form of internal moulds. The largest specimen of the first of these species, which may be recorded as " species A ", is about 60 mm. long. The ornament consists of closely and irregularly arranged concentric ridges, the average distance between which varies to some extent in different specimens but is always well below 1 mm. No trace of radial ornament can be detected. This form is less inflated than *F. lajoyei* (d'Archiac) (1843 : 372, pl. 27, figs. 1*a–d*), from the Bathonian of north-western Europe, and differs further in the closer arrangement of its concentric ridges and in the absence of radial ornament. In an English Great Oolite specimen of *F. lajoyei* figured by Morris & Lycett (1853, pl. 7, fig. 12) the ribs are more closely spaced in later stages of growth than in early stages, but they are further apart than in the East African specimens.

Fimbria sp. " B "

Pl. 15, fig. 12

1960. *Corbis lajoyei* d'Archiac ; Joubert, pl. 9, fig. 7*a*.

MATERIAL. About four specimens.

LOCALITIES AND HORIZON. Muddo Erri, and Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

REMARKS. A second species of *Fimbria* found in the Muddo Erri Limestones is the one of which a broken specimen has been figured by Joubert (1960) as *Corbis lajoyei*. It has relatively distant concentric ridges with intervals in which radial threads are well seen. This species is probably distinct from the true *F. lajoyei*, but this point cannot be decided definitely owing to the poor state of preservation of the material. Several of the Kenya specimens, like the one represented in Joubert's pl. 9, fig. 7*b*, are internal moulds and quite unidentifiable.

Fimbria quennelli sp. nov.

Pl. 16, fig. 7

SPECIFIC NAME. After Mr. A. M. Quennell, formerly Director of the Tanganyika Geological Survey.

DIAGNOSIS. Large, with the height four-fifths of length (93 mm. in holotype), broadly rounded anteriorly, tapering posteriorly to a low, subtruncate extremity. Umbo moderately prominent, submedian ; postero-dorsal outline almost straight, sloping to meet low subvertical posterior margin in a rounded-off, obtuse angle ; antero-dorsal outline well excavated ; ventral margin asymmetrical, strongly convex anteriorly, more weakly convex posteriorly. An obtuse ridge, best seen in later stages of growth, runs from postero-ventral angle of shell towards umbo. Ornament consisting of coarse, rounded concentric ribs separated by much narrower furrows and crossed by weak radial riblets, best seen on anterior half of surface. Ventral margin crenulated internally.

HOLOTYPE AND PARATYPE. Holotype, no. LL.16841 and one imperfect paratype.

LOCALITY AND HORIZON. Usigiwa river, 6 miles W.S.W. of Kiwangwa, Bagamoyo hinterland, Tanganyika ; Upper Oxfordian.

REMARKS. In few of the described Jurassic species of *Fimbria* do specimens approach the present ones in size. De Loriol (1872 : 260 ; 1888 : 240, pl. 26, figs. 1, 2), however, has recorded some equally large specimens, from the Lower Kimmeridgian of France and Switzerland, under the name *Corbis buvignieri* ; they differ from the form now recorded in the absence both of the diagonal ridge and of radial ornament. In *Corbis jaccardi* Rollier (1913 : 249, pl. 17, fig. 1), an equally large form from the Upper Oxfordian of Switzerland, a diagonal ridge is present but the shell is more elongate than in the African specimens, the concentric ribs are narrower, and radial ornament is lacking. *Corbis episcopalis* de Loriol (1891 : 193, pl. 21, figs. 2–4) bears radial ornament, but is much smaller than the specimens now described and tapers less towards its posterior extremity.

Fimbria sp. " C "

Pl. 15, fig. 10

MATERIAL. One specimen (no. LL.35126), *ex* B.P. Coll.

LOCALITY AND HORIZON. Lonji creek, W. of Mandawa, Tanganyika. Upper Kimmeridgian.

REMARKS. This specimen is a broken and eroded left valve, about 53 mm. long, with a broadly rounded umbo which is slightly posterior to median in position. The ornament consists of broad, rounded, depressed ribs which are unequal in width and separated by narrower intervals in which there are traces of radial threads. The broadness of the ribs is a particularly noticeable feature. The form from the Lower Kimmeridgian of Valfin, in the French Jura, described by de Loriol (1888 : 240, pl. 26, figs. 1, 2) as *Corbis buvignieri* Deshayes, and re-named *Corbis canaliculata* by Rollier (1913 : 256), is comparable in this respect, but it is a larger shell and its ribs are not quite so broad. It is most probable that the specimen now recorded belongs to a new species.

Genus ***SPHAERA*** J. Sowerby 1822

Sphaera subcorrugata Dietrich

1933. *Corbis* (*Sphaera*) *subcorrugata* Dietrich : 49, pl. 6, figs. 81, 82.

MATERIAL. Two specimens (nos. L.51169, L.51891).

LOCALITIES AND HORIZONS. N. of Kipande, near Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed. 3 miles N.N.W. of Tapaira, near Tendaguru ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

Genus *SPHAERIOLA* Stoliczka 1871

Sphaeriola madridi (d'Archiac)

Pl. 16, figs. 3, 4

1843. *Cardium madridi* d'Archiac : 373, pl. 25, figs. 7*a*, *b*.
1867. *Corbis* (*Sphaera*) *madridi* (d'Archiac) ; Laube : 38, pl. 3, fig. 4.
1921. *Unicardium* (*Sphaeriola*) *madridi* (d'Archiac) ; Cossmann, pl. 3, figs. 14, 15.
1948. *Sphaeriola madridi* (d'Archiac) ; Cox & Arkell : 35.

MATERIAL. Several specimens.

LOCALITY AND HORIZON. 1 mile N. of Asaharbito, N.E. Kenya ; Bathonian [? or Callovian], Asaharbito Beds.

REMARKS. These specimens do not appear to be distinguishable from *S. madridi*. The concentric corrugations which form their ornament are somewhat unequal and irregularly distributed, much as in the specimens figured by Laube. It is probable that the regularity of their arrangement in d'Archiac's original figure is due to their inaccurate representation by the artist. It has not been possible to expose the hinge-teeth in any of the African specimens and to confirm that the dentition is that of a *Sphaeriola* rather than of the externally similar genera *Mactromya* and *Unicardium*. A fragment of an internal mould in the material studied shows, however, traces of crenulations of the ventral margin, such as are found in *Sphaeriola* and not in the other two genera. The identification of *Sphaeriola* is important stratigraphically, as the known range of the genus is from Lias to Callovian and it is particularly abundant in the Bathonian.

Superfamily **CARDIACEA**

Family **CARDIIDAE** Goldfuss 1820

Genus ***PROTOCARDIA*** Beyrich 1845

Protocardia africana sp. nov.

Pl. 16, figs. 2*a*, *b*, *c*

1908*b*. *Protocardia* cf. *striatula* Sow. ; Thevenin : 27, pl. 4, fig. 5.

DIAGNOSIS. Of small-medium size (length of largest specimen 21 mm.), suborbicular, equilateral, height slightly less than length, shell evenly and strongly inflated. Umbones rather narrowly rounded, prominent, well incurved to the very slightly prosogyrous beaks. Margins forming a strongly convex and uninterrupted curve ; anterior end of shell only slightly less broad than posterior end. No diagonal ridge. Flank unornamented except for growth-lines ; posterior area not flattened, with about 30 granose radial riblets.

HOLOTYPE AND PARATYPES. Holotype, no. LL.35603. Several paratypes (nos. LL.35063–72).

Locality and horizon. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

Remarks. This species resembles the European Upper Lias-Bajocian species *Protocardia subtruncata* (d'Orbigny) (= *Cardium truncatum* Goldfuss, 1837 : 218, pl. 143, figs. 10*a–c*, *non* Phillips) in size and in the general shape of the shell ; it differs, however, in its slightly more prominent umbones, in the absence of a diagonal ridge, in its more rounded posterior margin, and in the presence of granules on the radial riblets on its posterior area. *Protocardia ferruginea* Rollier (= *P. striatula* Benecke 1905 : 228, pl. 17, figs. 1–4, *non* J. de C. Sowerby), to which the Yorkshire Dogger species erroneously attributed to *P. striatula* (J. de C. Sowerby) by Phillips (1829, pl. 11, fig. 7) also probably belongs, commonly attains a considerably larger size than that of the present East African specimens, and the riblets on its posterior area are not so conspicuously granose.

Protocardia besairiei sp. nov.

Pl. 16, figs. 8, 9*a*, *b*, 10

Specific name. After Monsieur H. Besairie, who collected specimens of the species from Madagascar.

Diagnosis. Of medium size (length c. 30 mm.), ovate, strongly inequilateral, height about two-thirds of length, beaks from anterior fifth to quarter of length; inflation moderately strong. Umbones broadly rounded, depressed, well incurved to the prosogyrous beaks. Postero-dorsal margin subhorizontal or gently sloping, forming a rounded-off, obtuse angle with more or less oblique, flattened posterior margin ; ventral margin of feeble convexity ; anterior margin strongly convex, anterior end of shell relatively narrow for a *Protocardia* ; antero-dorsal outline strongly concave. A weak diagonal ridge is present, bordering a rather flattened posterior area. Flank ornamented with somewhat irregular and unequal, rounded concentric ribs. Posterior area with fine radial grooves separating weak riblets.

Holotype and paratypes. Holotype, no. LL.35128, *ex* B.P. Coll., the only specimen from East Africa examined. Paratypes, nos. L.74972–79, from Madagascar.

Localities and horizon. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika (type-locality) ; Bajocian (?), Pindiro Shales. Mont Bovy, Maevatanana, N.W. Madagascar ; Bajocian.

Remarks. No closely comparable described species can be cited. Obvious differences which distinguish it from *P. beneckei* Rollier (1912 : 113, 121) (= *Protocardia* sp. ; Benecke, 1905 : 231, pl. 17, figs. 7, 8), from the Lower Bajocian of Lorraine, are its ovate and inequilateral, rather than orbicular, outline, and its rugose, irregularly ornamented flank.

Protocardia bipi sp. nov.

Pl. 17, figs. 1, 2, 3*a*, *b*

Specific name. After " B.P. " (British Petroleum Co. Ltd.), whose geologists collected the type material.

Diagnosis. Of medium size (length of largest specimen c. 28 mm.), very variable in shape and proportions, ovate to trigonally ovate, subequilateral to strongly inequilateral, beaks from anterior fifth of length to submedian, length exceeding height to a variable extent, inflation moderately strong. Umbones rather narrowly rounded, moderately prominent, well incurved to the beaks, which vary from orthogyrous to strongly prosogyrous according to their position. Postero-dorsal margin subhorizontal to gently sloping, posterior margin subvertical to strongly oblique, the two meeting in an even curve ; ventral margin symmetrical and feebly convex to strongly asymmetrical with posterior flattening ; anterior margin flat to feebly convex, its inclination variable. A distinct diagonal ridge, well marked in earlier growth-stages, delimits the slightly flattened posterior area. Flank unornamented except for growth-rugae. Posterior area with fine radial grooves.

Holotype and paratypes. Holotype, no. LL.35129 ; several paratypes, including nos. LL.35130–31 ; all *ex* B.P. Coll.

Locality and horizon. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika ; Bajocian (?), Pindiro Shales.

Remarks. This species is highly variable. The more elongate specimens show some approach in shape to *P. besairiei*, described above, but their beaks are not prosogyrous, the umbonal ridge does not persist to the postero-ventral angle of the shell, and the flank is more delicately ornamented.

Protocardia consobrina (Terquem & Jourdy)

Pl. 16, fig. 5

1869. *Cardium consobrinum* Terquem & Jourdy : 102, pl. 11, figs. 1–3.

Material. Two specimens (nos. LL.35132–33), *ex* B.P. Coll.

Locality and horizon. Changogo–Magindu track 4 miles from Changogo town, Tanganyika ; Callovian.

Remarks. In these specimens, the larger of which is 27 mm. long, the shell is suborbicular and strongly and evenly inflated, with no diagonal ridge present at any stage of growth. The umbo is submedian and moderately prominent. The flank is smooth, while the posterior area bears shallow radial grooves, about 12 of which are distinguishable on the better preserved specimen, separating flattened radial riblets.

I cannot distinguish between the African specimens and *P. consobrina*, as described and figured by its authors from the Bathonian of France. A French Callovian species, *P. boonei* Cossmann (1924 : 47, pl. 6, figs. 57, 58), is very similar in size and shape, but has finer and more numerous radial riblets on its posterior area. *P.*

consobrina has been recorded from Madagascar by Douvillé and others, while Dacqué (1910 : 30) has recorded a " *Cardium* sp. ", said to resemble this species, from Callovian beds at Km.127 along the railway from Dar-es-Salaam to Morogoro.

Protocardia rahmuensis sp. nov.

Pl. 17, figs. 4*a*, *b*

DIAGNOSIS. Of medium size (length of holotype c. 20 mm.), suborbicular, length and height almost equal, rather strongly inflated. Umbo prominent, median, with strongly convex outline. Antero-dorsal outline well excavated, anterior and ventral margins forming an even curve of strong convexity ; posterior margin slightly less convex than anterior one and forming a rather ill-defined, obtuse angle with ventral margin ; level of postero-dorsal margin slightly higher than that of antero-dorsal margin. Posterior area separated from flank by obtuse ridge and bearing nearly 20 radial riblets. Traces of fine concentric ridges preserved on flank of shell.

HOLOTYPE. No. L.92257, an internal mould. One or two further specimens are ill-preserved and should scarcely rank as paratypes.

LOCALITIES AND HORIZON. River section W. of Rahmu–El Wak road, 5½ miles S.W. of Rahmu (type-locality) ; Uacha, 6 miles S. of Rahmu, S.E. Kenya : both Oxfordian, Rahmu Shales.

REMARKS. The most closely comparable European Oxfordian species is *Protocardia intexta* (Münster), illustrated in a number of standard monographs by figures many of which have been subsequently re-named. In *P. roemeri* Rollier (for *Cardium intextum* Roemer (1839, pl. 19, fig. 3 ; also de Loriol 1897, pl. 12, fig. 10)) the antero-dorsal and postero-dorsal outlines of the shell are less strongly excavated. *Protocardia valbertensis* de Loriol (1901 : 61, pl. 4, figs. 12–14), which Roeder (1882 : 89, pl. 3, figs. 4*a*–*c*) had figured as *P. intexta*, closely resembles the African species in outline and ornament, but is much smaller. A poorly preserved *Protocardia* of about the same size which occurs commonly in the Golberobe Beds (Oxfordian) has a less prominent umbo and appears to belong to a different species.

Protocardia schencki Müller

Pl. 17, figs. 5*a*, *b*

1900. *Protocardia schencki* Müller : 544, pl. 19, figs. 12, 13.
1914*b*. *Protocardia schencki* Müller ; Hennig : 170.
1933. *Protocardia schencki* Müller ; Dietrich : 52.

MATERIAL. Numerous specimens.

LOCALITIES AND HORIZONS. Scarp and stream bed at Kindope, N.N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed. Tingutitinguti creek, Nitongola creek, and Kindope river, all near Tendaguru, Tanganyika ; Upper Kimmeridgian, "*Trigonia smeei*" Bed. Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Indogrammatodon* Bed.

REMARKS. This is a small, orbicular, equilateral *Protocardia*, most specimens of which are evenly inflated, although a few have an obscure diagonal angulation. The largest specimens are about 15 mm. long. In one specimen which retains some of its original shell it can be seen that there are 15 or more riblets on the posterior area and that in earlier stages of growth these form a delicate reticulate pattern with closely arranged growth-threads.

Protocardia suprajurensis (Contejean)

Pl. 17, fig. 6

1860. *Cardium suprajurense* Contejean : 276, pl. 14, figs. 11, 12.
1875. *Cardium suprajurense* Contejean ; de Loriol : 61, pl. 13, fig. 43.
1878. *Cardium suprajurense* Contejean ; Struckmann : 94, pl. 4, figs. 5, 6.
1905. *Protocardia suprajurensis* (Contejean) ; Schmidt : 173.

MATERIAL. One specimen (no. LL.35134), *ex* B.P. Coll.

LOCALITY AND HORIZON. N. of Matapwa, Pindiro area, Tanganyika ; Upper Kimmeridgian.

REMARKS. The specimen consists of one valve of a subequilateral, moderately and evenly inflated representative of the Cardiidae, the height of which (c. 29 mm.) is approximately equal to the length. It is devoid of ornament except in later stages of growth, in which there are low, round-topped concentric ribs slightly more than 1 mm. wide, separated by narrow intervals. No trace of radial ribbing can be seen on the posterior part of the surface, which, however, is rather obscured by matrix.

This specimen seems to belong to *Protocardia suprajurensis*, a Kimmeridgian form originally described from the French Jura, where specimens attain about the same size. The affinities of the species have been disputed, Brauns having considered it to belong to *Anisocardia*. De Loriol and Struckmann, however, have expressed the opinion that it is a true cardiid, and it seems to be related to a group of species found in the Lower Cretaceous and similarly ornamented with concentric ribs. This group includes *Cardium rothpletzi* Dietrich, from the Neocomian of Tendaguru and *C. sphaeroideum* Forbes, from the Aptian of England, both of which attain a considerably larger size. Dietrich referred *C. rothpletzi* to his subgenus *Tendagurium*, but it does not appear to be closely related to the type-species of that taxon, and it is here included in *Protocardia*, *sensu lato*.

Subgenus ***TENDAGURIUM*** Dietrich 1933

Protocardia (Tendagurium) bannesiana (Contejean)

1860. *Cardium bannesianum* (*ex* Thurmann, MS.), Contejean : 276, pl. 15, figs. 1–5.
1862. *Cardium banneianum* Thurmann ; Thurmann & Étallon : 181, pl. 22, figs. 1*a*, *b*.
1872. *Cardium banneianum* Thurmann ; de Loriol : 249, pl. 15, figs. 1, 2.
1897. *Cardium banneianum* Thurmann ; Futterer : 600.
1912. *Nemocardium banneianum* Thurmann ; Lissajous : 91, pl. 11, fig. 10.
1930. *Cardium banneanum* Étallon ; Basse : 140, pl. 5, fig. 8.
1960. *Cardium* (*Protocardia?*) *bannesium* Contejean ; Joubert, pl. 10, fig. 6*b*.

Material. One specimen (no. L.92194).

Locality and horizon. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya ; Kimmeridgian, Hereri Shales.

Remarks. Dietrich founded the subgenus *Tendagurium* for equilateral Mesozoic Cardiidae lacking radial ornament. The question whether the type-species, *Cardium propebanneianum*, is specifically distinct from *C. bannesianum* is discussed below. There is no doubt that the two forms are closely related. In Europe this species appears to be confined to the Kimmeridgian.

Protocardia (Tendagurium) propebanneiana (Dietrich)

Pl. 16, fig. 6

1933. *Cardium* (*Tendagurium*) *propebanneianum* Dietrich : 50, pl. 6, figs. 92, 93.

Material. About 10 specimens.

Locality and horizon. Tingutitinguti creek, Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

Remarks. Dietrich, when describing this species, discussed its possible identity with *Cardium bannesianum* Contejean, and concluded that it differs in its better developed posterior ridge and its less strongly convex pallial margin. These differences, however, are not strongly marked. Dietrich mentions a specimen of *C. propebanneianum* 80 mm. long, and the length of the largest of the specimens now recorded is 70 mm. These measurements are not greatly in excess of the maximum length of 65 mm. given by de Loriol for *C. bannesianum*. Dietrich mentions and illustrates a distinct pallial sinus in *C. propebanneianum*, whereas there is no sinus in *C. bannesianum*, but his figure has evidently been retouched to make the sinus obvious. Some of the specimens now recorded are internal moulds, but the pallial line is not clearly seen in any of them. The posterior adductor scar has, however, a well-marked anterior angle, and if this marks the point where the pallial line met the scar it is possible that a sinus may have been present and that the specific separation from *C. bannesianum* is justified.

Superfamily **ISOCARDIACEA [GLOSSACEA]**

Family **CERATOMYOPSIDAE** Cox 1964

Genus ***CERATOMYOPSIS*** Cossmann 1915

Ceratomyopsis basochiana (Defrance)

Pl. 17, figs. 7, 8*a*, *b*

1822. *Isocardia basochiana* Defrance : 18.
1822*b*. *Isocardia basochiana* Defrance ; J. Sowerby, Part 7, " *Isocardia* " pl., fig. 4.
1850*a*. *Ceromya sarthacensis* d'Orbigny : 336.
1900. *Isocardia striata* d'Orbigny ; Müller : 534, pl. 18, figs. 1*a*, *b* (*non* d'Orbigny).

1903. *Isocardia basochiana* Defrance ; Bigot & Matte : 167.
1910. *Ceromya concentrica* (Sow.) ; Dacqué : 33, pl. 5, fig. 5 (*non* Sowerby sp.).
1913. *Ceromyopsis kiliani* Rollier : 268, pl. 15, fig. 9.
1915*b*. *Ceratomyopsis dassei* Cossmann : 7, pl. 2, figs. 1–3.
1924. *Isocardia substriata* Hennig : 67 (*partim*).
1925. *Ceromya sarthacensis* d'Orbigny ; Cottreau : 9, pl. 37, figs. 7, 8.
1937*b*. *Ceromyopsis substriata* (Hennig) ; Cox : 202, pl. 16, fig. 4.
1960. *Ceromyopsis kiliani* Rollier ; Joubert, pl. 11, figs. 2*a*, *b*.

MATERIAL. Three specimens.

LOCALITIES AND HORIZONS. 2 miles E. of Magindu Station, Central Railway, Tanganyika ; Callovian. Hills S. of Rahmu–Melka Murri road, 13 miles W. of Rahmu, N.E. Kenya ; Callovian, Rukesa Shales. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

REMARKS. Defrance's description and Sowerby's figure of this species have been overlooked by most authors. Bigot & Matte have recorded that Defrance's holotype was from the Callovian and there seems no doubt that the species is identical with the later described *sarthacensis* d'Orbigny, *kiliani* Rollier and *dassei* Cossmann, all from the Callovian of France. The specimen from the Callovian of Tanganyika figured by Müller as *Isocardia striata* and included by Hennig in his *Isocardia substriata* is characterized by its strongly coiled umbo, the tip of which is pointed upwards so as to form the summit of the shell. The specimen from Tanganyika now recorded (the one figured by me previously under Hennig's name *substriata*) closely resembles it in this respect. These shells are now considered to fall within the range of variation of *C. basochiana*.

Ceratomyopsis striata (d'Orbigny)

Pl. 17, fig. 9

1822. *Isocardia striata* d'Orbigny : 104, pl. 2, figs. 7–9.
1875. *Isocardia striata* d'Orbigny ; de Loriol : 56, pl. 13, figs. 35, 36.
1897. *Isocardia striata* d'Orbigny ; Futterer : 602, pl. 21, figs. 3, 3*a*.
1929. *Ceromyopsis striata* d'Orbigny, Futterer ; Weir : 32, pl. 3, fig. 8.
1935*a*. *Ceromyopsis striata* (d'Orbigny) ; Cox : 188, pl. 19, fig. 10.
1960. *Ceromyopsis striata* (d'Orbigny) ; Joubert, pl. 11, figs. 3*a*, *b*.

MATERIAL. One specimen (no. L.92191).

LOCALITY AND HORIZON. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya ; Kimmeridgian, Hereri Shales.

REMARKS. It is not certain that this species differs morphologically from *C. basochiana* (Defrance), described in the same year, although it has been customary to draw a specific distinction between specimens from their respective horizons, Kimmeridgian and Callovian. The variability of *C. striata* is illustrated by the figures published by de Loriol (1875).

Superfamily **ARCTICACEA**

Family **ARCTICIDAE** Newton 1891

Genus ***PRONOELLA*** Fischer 1887

Pronoella pindiroensis sp. nov.

Pl. 17, figs. 12, 13, 14*a*, *b*, 15, 16, 17*a*, *b*

DIAGNOSIS. Of medium size (length of largest specimen 33 mm.), elongate-cuneiform, strongly inequilateral, height from one-half to two-thirds of length, beaks between anterior quarter and fifth of length ; some but not all specimens posteriorly rostrate, some strongly inflated, others only moderately so even when apparently uncrushed. Umbo not prominent, broadly rounded to obtusely angular, slightly incurved to prosogyrous beak. Postero-dorsal outline parasigmoidal to feebly and evenly convex and ventral margin posteriorly sinuate or feebly and evenly convex according to presence or absence of posterior rostrum ; posterior margin low, almost straight, oblique ; antero-dorsal outline slightly concave ; anterior margin broadly convex. Lunule moderately broad and deep, not distinctly bordered ; bordering ridges of escutcheon absent or ill-defined. An obtuse angulation, straight or parasigmoidal according to presence or absence of posterior rostrum, and scarcely defined in some specimens, runs from beak to postero-ventral corner. Surface ornamented with irregular concentric threads or rugae which are present on all the anterior part but tend to disappear on the posterior part of the flank, and are absent from the posterior area.

HOLOTYPE AND PARATYPES. Holotype, no. LL.35135. There are numerous paratypes including nos. LL.35136–40, but many are crushed. All *ex* B.P. Coll.

LOCALITIES AND HORIZON. Near site of Mandawa well no. 1, Tanganyika (type-locality) ; Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika ; Bajocian (?), Pindiro Shales.

DESCRIPTION. The description given in the diagnosis may be supplemented by an account of the dentition, which is that of a typical *Pronoella*. Right valve with an elongate posterior cardinal (3*b*), obscurely bifid and almost parallel with postero-dorsal margin ; a triangular median cardinal (1) with its broad apex well separated from the beak and tapering anteriorly to be continued by a thin anterior lateral (Ai) ; a very thin, elongate anterior cardinal (3*a*) passing into an equally thin lateral (Aiii), the two separated by a very narrow recess from the adjacent margin ; and an elongate posterior lateral (Pi), separated by a recess from the margin : left valve with three cardinal teeth of which the posterior (4*b*) is thin and elongate, lying along the lower margin of the ligamental nymph, the median (2*b*) is stout, bifid, and inclined backward from the beak, and the anterior (2*a*) is moderately stout and elongate and lies close to the antero-dorsal margin.

REMARKS. At first sight the specimens included in this species appear to belong to at least two different species, but there appears to be complete intergradation between specimens with a well-developed posterior rostrum and those with no rostrum. The rostrate specimens closely resemble the Hettangian species *Cypricardia triangularis* Terquem (1855 : 304, pl. 20, figs. 14, 14*a*), which may be a *Pronoella*. Except for the small size the present species also much resembles *Pronoella elongata* Cox, from the Aalenian of England, type species of the subgenus *Gythemon* Casey, but its dentition resembles that of *Pronoella* s.str. (Casey 1952 : 145, text-fig. 34) rather than that of *Gythemon* (Casey : 151, text-fig. 47) in the relative strengths of the various hinge-teeth and in the anteriorly pointing direction of the tooth (1).

Pronoella putealis sp. nov.

Pl. 17, figs. 10, 11

Diagnosis. Of small-medium size (length of holotype 21 mm.), cuneiform, moderately inequilateral, height two-thirds of length, beaks at anterior three-sevenths of length ; inflation apparently only moderate (the specimens have, however, suffered compression). Umbo obtusely angular, moderately prominent, slightly incurved to prosogyrous beak. Antero-dorsal and postero-dorsal outlines concave, the latter forming an obtuse angle with the low, subvertical posterior margin ; ventral margin of feeble to moderate convexity ; anterior margin broadly convex. No bordered lunule or escutcheon ; a thin, raised keel runs from the beak to the postero-ventral corner. Surface ornamented with fine, regular concentric threads, which are absent from the area dorsal to the keel. Hinge-teeth (seen only in fragments from well washings) as in typical *Pronoella*, but median cardinals (1) and (2*a*) stouter in than *P. pindiroensis*.

Holotype and paratypes. Holotype, no. LL.35141 ; two paratypes, including no. LL.35142. There are also several fragments from well sample washings. All *ex* B.P. Coll.

Localities and horizon. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika (type-locality) ; Mandawa well no. 6, Tanganyika (depths 46–64 feet) : Bajocian (?), Pindiro Shales.

Remarks. This species is smaller than *P. pindiroensis* and is also readily distinguishable by its fine, regular concentric ornament.

Pronoella kidugalloensis sp. nov.

Pl. 18, figs. 1*a*, *b*

Diagnosis. Of medium size (length 24·5 mm.), cuneiform, strongly inequilateral, height about three-quarters of length, beaks at anterior sixth of length, inflation moderately strong. Umbo broadly rounded, slightly incurved to the prosogyrous beak, its outline continuous posteriorly with the feebly convex, rather steeply sloping postero-dorsal outline of shell. Posterior margin low, subvertical ; ventral margin with very shallow sinus posterior to middle of its length, and merging anteriorly in a broad curve with the feebly convex, prosocline anterior margin ; antero-dorsal outline a little excavated. Lunule broad and deep ; escutcheon broad but shallow, its bordering ridges rather obscure ; diagonal ridge distinct near umbo but dying out before reaching postero-ventral corner of shell. Ornament consisting of narrow and rather irregularly spaced concentric folds (obliterated by erosion on part of surface of holotype). Internal characters unknown.

HOLOTYPE. No. LL.35143, *ex* B.P. Coll. There is also a fragment of a second specimen.

LOCALITY AND HORIZON. 1½ miles N.N.W. of Kidugallo, Central Railway, Tanganyika ; Bajocian.

REMARKS. This species is referred to *Pronoella* on account of its general resemblance to *P. pindiroensis* sp. nov., from which it differs in its less elongate but more strongly inequilateral form, its broader lunule, and its more strongly ribbed surface.

Genus *ANISOCARDIA* Munier-Chalmas 1863

Anisocardia arkelli sp. nov.

Pl. 18, figs. 5*a*, *b*

SPECIFIC NAME. After the late Dr. W. J. Arkell.

DIAGNOSIS. Of medium size (length of largest specimen 17·5 mm.), subtrigonal, inequilateral, length well exceeding height, beaks at about anterior third of length ; inflation strong. Umbo prominent, narrowly rounded, well incurved, with beak strongly prosogyrous. Postero-dorsal outline feebly convex, steeply sloping ; posterior margin low, sharply convex ; ventral margin of moderate and even convexity ; anterior margin narrowly rounded, with anterior extremity low, at about one-quarter of shell height ; antero-dorsal outline strongly concave. No distinct posterior umbonal ridge present.

HOLOTYPE AND PARATYPES. Holotype, no. LL.35051. Four paratypes, nos. LL. 35052–55.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. This species bears some resemblance to *A. gibbosa* (Münster) (Cox, 1947 : 161, text-figs. 29*a*, *b*), from the European Bajocian, but is smaller and less gibbose.

Anisocardia didimtuensis sp. nov.

Pl. 18, fig. 4

DIAGNOSIS. Of medium size (length of holotype 20·8 mm.), subtrigonal, inequilateral, length well exceeding height, beaks at about anterior third of length ; inflation strong ; umbo prominent, narrowly rounded, very strongly incurved, with beak strongly prosogyrous. Postero-dorsal outline strongly convex near umbo, slightly concave more posteriorly, steeply sloping, forming an obtuse angle with short, subvertical posterior margin ; ventral margin of even and very feeble convexity ; anterior margin abruptly rounded, anterior extremity low, at about one-fifth of shell height. No well-defined posterior umbonal ridge present.

HOLOTYPE. No. L.35056. The only specimen.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. This species appears to be distinct from *A. arkelli*, with which it occurs associated. The umbo is more elevated than in that species, the beak considerably more incurved and strongly prosogyrous, and the antero-dorsal outline more excavated. The slight concavity of the postero-dorsal outline, moreover, is not seen in *A. arkelli*.

A specimen from the Upper Lias of Madagascar figured by Thevenin (1908*b* : 29, text-fig. 24) as *Gresslya* cf. *pinguis* Agassiz is not a *Gresslya*, but an *Anisocardia* which differs from the species now described in its rather higher anterior extremity and its less strongly prosogyrous beak. *Anisocardia fullonica* Cox (1947 : 164, text-figs. 34*a*, *b* ; pl. 9, fig. 73), from the Lower Bathonian (Fuller's Earth Rock) of southern England, closely resembles the form now described but is more tumid and has a less evenly convex ventral margin.

Anisocardia ayersi sp. nov.

Pl. 18, figs. 6*a*, *b*

SPECIFIC NAME. After Mr. F. M. Ayers, of the Kenya Geological Survey, who first discovered the beds at Didimtu.

DIAGNOSIS. Of medium size (length of holotype 20·5 mm.), subovate, length slightly exceeding height, beaks at about anterior quarter of length, inflation moderate. Umbo not prominent, narrowly rounded in outline, moderately incurved and prosogyrous. Postero-dorsal outline feebly convex, sloping gently, and forming an obtuse angle with the straight, slightly oblique posterior margin ; ventral margin of moderate and even convexity ; antero-dorsal outline slightly concave ; anterior margin broadly rounded, anterior extremity at about one-third of shell height. No distinct posterior umbonal ridge present.

HOLOTYPE. No. LL.35057. The only specimen.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. This species bears some resemblance to *A. stamfordensis* Cox (1947 : 160, text-figs. 24*a*, *b* ; pl. 9, fig. 72), Bajocian of England, but its umbo is less prominent, it lacks a posterior umbonal ridge, and its ventral margin is not flattened posteriorly, as in that species.

Anisocardia minima (J. Sowerby)

Pl. 18, fig. 8

1821*a*. *Isocardia minima* J. Sowerby : 171, pl. 295, fig. 1.
1934*a*. *Anisocardia minima* (J. Sowerby) ; Arkell : 275, pl. 36, figs. 8–11.
1947. *Anisocardia minima* (J. Sowerby) ; Cox : 170, text-figs. 43*a*, *b*.

MATERIAL. One specimen (no. L.92120).

LOCALITY AND HORIZON. Hills S. of Rahmu–Melka Murri road, 13 miles W. of Rahmu, N.E. Kenya ; Callovian, Rukesa Shales.

REMARKS. This specimen, about 21 mm. long, is not distinguishable from English specimens of this well-known species, discussed in my 1947 paper. The range of the species in Europe is from Upper Bajocian to Callovian or possibly Oxfordian.

Anisocardia kinjeleena sp. nov.

Pl. 18, fig. 3

DIAGNOSIS. Shell of medium size for the genus (length of holotype 17·5 mm.), subquadrate, with height little less than length ; inflation rather feeble. Umbo projecting slightly above postero-dorsal outline, and well incurved to strongly prosogyrous beak, which lies at about anterior quarter of length of shell. Posterior margin straight, forming a rounded-off angle which is only slightly greater than a right angle with straight postero-dorsal outline and a slightly less well-defined angle with moderately and symmetrically convex ventral margin. Anterior end of shell rather low, with strongly convex margin ; antero-dorsal outline well excavated. Diagonal ridge sharp, presenting an upward-facing convexity along its entire length, and delimiting a strongly concave postero-dorsal area.

HOLOTYPE AND PARATYPES. Holotype, no. L.51938. Three paratypes.

LOCALITIES AND HORIZONS. Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru, Tanganyika (type-locality) ; Upper Kimmeridgian, *Indogrammatodon* Bed. Kindope valley, N.N.W. of Tendaguru ; Upper Kimmeridgian, *Nerinella* Bed.

REMARKS. This species is referred to *Anisocardia* rather than to *Opis* as the specimens have no trace of concentric ornament, which is usually visible even on internal moulds of the latter genus. Its subquadrate form and high postero-dorsal angle serve to distinguish it from any species of *Anisocardia* described previously.

Genus ***EOTRAPEZIUM*** Douvillé 1913

Eotrapezium ? africanum sp. nov.

Pl. 18, figs. 7*a*, *b*

DIAGNOSIS. Of medium size (length of holotype 32·3 mm.), subrectangular, elongate, inequilateral, beaks at anterior quarter of length, inflation moderate. Umbonal outline obtuse, umbones slightly incurved ; postero-dorsal margin almost straight, subhorizontal, forming an obtuse angle with the straight, slightly oblique posterior margin ; ventral margin almost straight ; antero-dorsal outline strongly concave ; anterior margin strongly convex. An obtusely rounded ridge, curved with an upward-facing convexity, runs from the umbo to the postero-ventral corner in each valve. Pallial line entire.

HOLOTYPE. No. LL.35058. There are also two very imperfect specimens.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. The specimens are internal moulds and details of their hinge-structure cannot be ascertained. The species is referred, with a query, to *Eotrapezium* because its subrectangular outline resembles that of some specimens of the Lower Liassic type species, *Mesodesma germari* Dunker, such as those from Portugal figured by Boehm (1901, pl. 10, figs. 6, 7). Alternatively, it could conceivably belong to the Astartidae, but its strongly excavated antero-dorsal outline and greater inflation distinguish it from known species of the astartid subgenus *Leckhamptonia*, in which the rectangular outline of the shell is somewhat similar. No closely comparable species has been described previously from the Upper Lias.

Eotrapezium ? thompsoni sp. nov.

Pl. 18, figs. 2*a*, *b*

SPECIFIC NAME. After Mr. A. O. Thompson, of the Kenya Geological Survey, collector of the type material.

DIAGNOSIS. Of small-medium size (length 17 mm.), trapeziform, inequilateral, length not greatly exceeding height, beaks at anterior quarter of length ; inflation rather weak (but holotype somewhat crushed). Umbonal outline obtuse, umbones scarcely incurved ; postero-dorsal outline feebly convex, subhorizontal, forming an obtuse angle with the straight, slightly oblique posterior margin ; ventral margin of feeble convexity, diverging slightly from postero-dorsal outline in a posterior direction ; antero-dorsal outline moderately concave ; anterior margin strongly convex. An obtusely rounded ridge, curved with an upward facing convexity, runs from the umbo to the postero-ventral corner. Surface ornamented with concentric threads.

HOLOTYPE. No. LL.35061. There is also one very imperfect specimen.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Upper Lias, Toarcian, Didimtu Beds.

REMARKS. This species bears a general resemblance to *Eotrapezium*? *africanum*, described above, but differs in its much shorter form.

Eotrapezium ? kenti sp. nov.

Pl. 18, figs. 9*a*, *b*, 10*a*, *b*

SPECIFIC NAME. After Dr. P. E. Kent, of the British Petroleum Company, Ltd.

DIAGNOSIS. Shell of medium size (length of holotype c. 27 mm.), ovate-cuneiform, height about four-fifths of length, inflation moderate. Umbo broadly rounded, incurved to the moderately prosogyrous beak, which is situated at the anterior quarter of the length of the shell ; outline of umbo continuous with the evenly convex postero-dorsal outline, which slopes at a fairly steep angle to the low, abruptly rounded posterior extremity. Ventral margin feebly convex, continuous with strongly and evenly convex anterior margin ; antero-dorsal outline well excavated. Lunule shallow, not bordered ; escutcheon ridge as well as ridge running diagonally from umbo to postero-ventral corner weakly defined. Surface ornamented in later growth-stages with narrow, irregular concentric undulations.

Hinge-teeth of right valve consisting of elongated outer posterior cardinal (4*b*) adjacent to nymph, a strong, well elongated inner posterior cardinal (2 of Douvillé, $2b_2$ of Casey) sloping back from the beak, an equally strong and similarly well elongated anterior cardinal ($2b_1$ of Casey) diverging at obtuse angle from inner posterior cardinal, and an anterior lateral Aii, which is separated from the anterior cardinal by a distinct constriction.

Holotype and paratypes. Holotype, no. LL.35144 ; two paratypes, including no. LL.35145 ; all *ex* B.P. Coll.

Locality and horizon. Magole, 5 miles N.W. of Kidugallo, Tanganyika ; Bajocian.

Remarks. As the dentition of the right valve is unknown it is not possible to assign this species to any genus with complete confidence. The hinge of the left valve agrees with that of the type-species of *Eotrapezium*, *Mesodesma germari* Dunker, from the Lower Lias, as figured by Boehm (1901 : 238, fig. 19) and by Douvillé (1913 : 455, fig. 38), in the elongation and broad divergence of the two inner cardinal teeth, but the anterior of these passes without any interruption into the anterior lateral in *E. germari* and in two other species of *Eotrapezium* figured by Douvillé (1913, figs. 40, 42), whereas it is separated from it by a distinct constriction in the species now described. The dentition of the left valve of this species also bears some resemblance to that of *Anisocardia* (*Antiquicyprina*) *loweana* (Morris & Lycett), from the English Bathonian, as figured by Casey (1952 : 151, fig. 49), but the two inner cardinal teeth are much more elongated than in the species in question.

Family **NEOMIODONTIDAE** Casey 1955

Genus ***EOMIODON*** Cox 1935

Eomiodon baroni (Newton)

Pl. 18, fig. 11

1889. *Astarte? baroni* Newton : 336, pl. 14, figs. 9–11.
1936. *Astarte baroni* Newton ; Besairie : 121, pl. 7, figs. 1, 2.

Material. Several specimens.

Localities and horizons. Quarries N.N.E. of Ngerengere, Central Railway, Tanganyika ; Bajocian (?). 6 miles N.W. of Kidugallo, Tanganyika ; Bajocian (B.P. Coll.).

REMARKS. Newton's holotype of *Astarte*? *baroni*, from Madagascar, is so ill-preserved that when describing the specimens from India (Cox 1935*b* : 7, pl. 1, figs. 17–19) upon which I founded the genus and species *Eomiodon indicus* I did not recognize their generic affinity with it. Examination of further material from Madagascar has left me with no doubt on this point. The two forms are similar in size and outline, but *E. indicus* is much more strongly inflated than any specimens of the Madagascan species which I have examined, and it is doubtful if they should be placed in synonymy.

Of the specimens now recorded fom Tanganyika, those from Ngerengere are quite typical. Those from the locality near Kidugallo, only two in number, are relatively small, the larger being only 19 mm. long, and the relatively wide-spaced concentric ridges of the earlier growth-stages are replaced by closely spaced ridges at a shorter distance from the umbo than in typical specimens. They could possibly belong to a distinct species or subspecies, but there is insufficient material for a decision to be reached on this point.

Eomiodon tanganyicensis sp. nov.

Pl. 18, figs. 12*a*, *b*, 13

DIAGNOSIS. Of medium size (length of holotype c. 27 mm.), cuneiform, moderately inflated. Umbones anteriorly placed but not quite terminal, well incurved to the strongly prosogyrous beaks. Postero-dorsal outline strongly convex anteriorly, less convex posteriorly, sloping to the low, subangular posterior extremity of the shell. Ventral margin strongly convex, merging anteriorly with the convex anterior margin ; antero-dorsal outline slightly concave. Escutcheon not distinctly bordered by a ridge. Surface of shell without marked concentric ornament.

Cardinal teeth consisting, in left valve, of stoutly triangular, anteriorly directed anterior tooth (2*b*) very close to antero-dorsal margin, and of a quite strong, elongate posterior tooth (4*b*) widely divergent from 2*b* ; in right valve, of stout, triangular, mesially placed tooth (3*b*) and narrow, weak anterior tooth (3*a*). Right valve with strong, lamelliform posterior lateral tooth (Pi) and a weaker, lamelliform anterior lateral (Ai), each separated from shell margin by a recess for the reception of a lateral tooth formed by a projection from the corresponding part of margin of left valve.

HOLOTYPE AND PARATYPES. Holotype, no. LL.7215. About 20 paratypes.

LOCALITY AND HORIZON. Quarries N.N.E. of Ngerengere, Central Railway, Tanganyika ; Bajocian (?).

REMARKS. The specimens are encrusted with fine sandy material, but their lack of concentric ornament appears to be an original feature and to distinguish them from *E. baroni*. The lack of an angular ridge bordering an escutcheon is another point of difference. They are less gibbose than *E. baroni*, but it is not possible to say if this difference is entirely due to the compression which most of them have undergone. Their dentition is that of a typical *Eomiodon*.

Eomiodon dinosaurianum sp. nov.

Pl. 18, figs. 15*a*, *b*, 16*a*, *b*

1933. *Cyrena* sp.; Dietrich : 46, pl. 8, fig. 125 ; ? pl. 11, fig. 147.

DIAGNOSIS. Shell small (usual length c. 12 mm.), trigonally ovate, variable in proportions but always longer than high, subequilateral to moderately inequilateral, with beaks lying between a position slightly posterior to median and the anterior quarter of the length ; inflation moderate (most specimens, however, are crushed). Umbo broadly rounded, slightly incurved to the moderately prosogyrous beak, its outline continuous with straight postero-dorsal outline of shell ; postero-dorsal outline sloping at a moderately steep angle to meet the usually short, straight posterior margin in an obtuse angle ; ventral margin convex to a variable extent, merging in an even curve with the strongly convex anterior margin ; antero-dorsal outline slightly concave. Escutcheon moderately wide, bordered by well-defined ridges ; lunule somewhat excavated, not bordered. A rather obscure diagonal ridge runs from the umbo to postero-ventral corner of shell. Ornament consisting of thin concentric ridges which fade away at a variable distance from the umbo, so that later growth-stages are smooth in all full-grown specimens ; ridges separated by much broader intervals.

HOLOTYPE AND PARATYPES. Holotype, no. L.53322. There are also numerous paratypes.

LOCALITY AND HORIZON. Tendaguru, Tanganyika ; excavation in Upper Kimmeridgian, dinosaur beds.

REMARKS. The specimens are preserved in fine-grained buff-coloured sandstone. The great amount of variation which they show appears to be largely due to original differences in shape, although many have suffered distortion and compression in fossilization. The species is not closely comparable to any previously described from the Upper Jurassic. *E. nortonensis* (Cox) (1944*b* : 111, text-fig. 4*c*), from the Lower Bathonian of England, is of about the same size as the East African species, but differs in its cuneiform and more elongate shape.

Eomiodon namgaruensis sp. nov.

Pl. 18, figs. 14*a*, *b*

DIAGNOSIS. Rather large for the genus (length of holotype 48 mm.), ovate-cuneiform, inequilateral, height about four-fifths of length, beaks at anterior fifth of length ; inflation strong. Umbo prominent, very broadly rounded, well incurved to the strongly prosogyrous beak. Postero-dorsal outline pronouncedly parasigmoidal, rather steep, forming an obtuse angle with the low, straight, oblique posterior margin ; ventral margin strongly convex ; antero-dorsal outline strongly concave ; anterior margin broadly convex. Escutcheon moderately wide, well impressed, bordered by sharp ridges ; lunule broad, cordate, well impressed, smooth, also bordered by a ridge in each valve. No distinct ridge runs from the beak to the postero-ventral corner of the shell. Early growth-stages ornamented with narrow, regular concentric ridges of which those farthest from the umbo are about 1 mm. apart ; remainder of shell with only irregular concentric rugae.

HOLOTYPE AND PARATYPE. Holotype, no. LL.35146 ; one broken paratype. Both *ex* B.P. Coll.

LOCALITY AND HORIZON. About 1 mile E.S.E. of Uleka, Mavudyi–Namgaru area, Tanganyika ; Jurassic (stage uncertain).

REMARKS. The dimensions of this shell, which has the unmistakable external characters of *Eomiodon*, exceed those of any previously known Jurassic species of the genus, but are less than those of *E. libanotica* (Fraas) (Vokes, 1946 : 172, pl. 5, figs. 1–12, as *Protocyprina libanotica*) from the Aptian of the Lebanon.

Subgenus ***AFRICOMIODON*** nov.

DIAGNOSIS. Well inflated, with anteriorly placed, prominent, strongly prosogyrous and incurved umbones. Escutcheon broader than in *Eomiodon* s.str. and bordered by ridges which are not so well defined as in that group ; in each valve one cardinal tooth (2*b* in the left, 3*b* in the right) is stoutly triangular, but remaining cardinals only feebly developed. Anterior lateral (Aii) in left valve and posterior lateral (Pi) in right valve strongly developed, remaining laterals weak.

TYPE SPECIES. *Eomiodon* (*Africomiodon*) *cutleri* sp. nov.

REMARKS. This new subgenus resembles *Eomiodon* s.str. in the general arrangement of the hinge teeth and in the presence of evenly spaced concentric ridges which are confined to earlier growth stages. It is distinguished by the very different shape and strong inflation of the shell and by the weakness of all the teeth except the four mentioned.

Eomiodon (***Africomiodon***) ***cutleri*** sp. nov.

Pl. 18, figs. 17, 18*a*, *b*

SPECIFIC NAME. After the late W. E. Cutler, the first leader of the British Museum East Africa Expedition.

DIAGNOSIS. Shell of medium size, with characteristic asymmetrical outline due to pronounced postero-dorsal angle and rather protruding, very anteriorly placed, prosogyrous umbones ; height (20·5 mm. in holotype) slightly exceeding length in most specimens. Postero-dorsal outline convex, gently sloping, forming rather pronounced, obtuse angle with feebly convex posterior margin ; this merges into the strongly and evenly convex ventral margin which is continued by the equally convex anterior margin, the two forming almost a semicircle ; antero-dorsal outline strongly excavated. The evenly spaced, well separated concentric ridges present in early growth stages (where they are particularly prominent on the posterior part of the surface) soon give way to the unevenly arranged concentric threads and rugae which occupy the greater part of the surface. Dentition as described in the subgeneric diagnosis (the indistinctness of all the teeth except *2b*, *3a*, Aii and Pi may be partly due to the fact that it has been necessary to develop out the hinge region from a hard limestone matrix in the specimens studied, but these teeth must have been quite weak originally).

Holotype and paratypes. Holotype, no. L.51995 ; numerous paratypes.

Localities and horizons. Tingutitinguti creek (type-locality) and Kipande, Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed. Scarp at Kindope, N. of Tendaguru ; Upper Kimmeridgian, *Nerinella* Bed.

Remarks. Notwithstanding some external similarity to specimens from the dinosaur beds of Tendaguru figured by Hennig (1914*b*, pl. 14, figs. 1*a–i*) as *Cyrena* sp., the hinge structure of the shells now described differs considerably from that of the two valves represented in Hennig's pl. 14, figs. *2a, b*. The form figured by Hennig does not seem to be represented in the material examined by the present writer. The *Cyprina* sp. of Dietrich (1933 : 46, pl. 8, fig. 125 ; pl. 11, fig. 147) seems to be the *Eomiodon dinosaurianum* of the present memoir.

Superfamily **TELLINACEA**

Family **TANCREDIIDAE** Meek 1864

Genus ***TANCREDIA*** Lycett 1850

Tancredia sp. " A "

Pl. 19, fig. 2

Material. One specimen (no. L.93625).

Locality and horizon. Korkai Hammassa, 19 miles E. of Takabba, N.E. Kenya ; Oxfordian, Golberobe Beds.

Description. This specimen is the internal mould of the right valve of a moderately elongate *Tancredia*, 22·3 mm. long and 11 mm. high. The umbo is slightly anterior to mid-length, and just in front of it there is a slight concavity of the antero-dorsal outline, which slopes at a rather gentle angle to the blunt anterior extremity of the shell. It is close to the *Tancredia* from the Oxfordian of Cordebugle (Calvados) figured by Chavan (1952, pl. 4, figs. 48–50) under the name *Corbicella* (*Corbicellopsis*) *autissiodorensis* (Cotteau), but its anterior end is more tapering and sharply rounded than in that species. It is also very similar to the English Bathonian species *T. extensa* Lycett, figured under the name *T. axiniformis* (Phillips) by Morris & Lycett (1855 : 93, pl. 12, fig. 7 ; pl. 13, figs. 6*a*, *b*), but its umbo is situated in a slightly more anterior position.

Tancredia sp. " B "

Pl. 19, fig. 3

Material. One specimen (no. L.93614).

Locality and horizon. Ogar Wein, 17 miles N.W. of Wergudud, N.E. Kenya ; Oxfordian, Golberobe Beds.

Description. This specimen is the internal mould of the right valve of a moderately elongate *Tancredia*, 20·5 mm. long and 11 mm. high. The umbo lies at about the posterior two-fifths of the length, and the slightly concave antero-dorsal outline slopes rather steeply to the abruptly rounded anterior extremity of the shell. The specimen is very much like the English Bajocian and Bathonian species *T. angulata* Lycett, as figured by Morris & Lycett (1855 : 94, pl. 12, fig. 8 ; pl. 13, figs. 9*a*, *b*).

Tancredia manderaensis sp. nov.

Pl. 19, fig. 1

Diagnosis. Shell of medium size (length of holotype 22 mm., height 13 mm.), moderately elongated, subequilateral. Antero-dorsal outline concave, sloping gently to the rather sharply rounded anterior extremity of the shell. Ventral margin of moderate convexity, the more strongly upcurved anteriorly. Posterior margin weakly convex, slightly prosocline, forming an obtuse angle with the almost horizontal postero-dorsal margin. Posterior diagonal ridge strong, delimiting a narrow, concave posterior area.

Holotype. No. LL.35190, consisting of the internal and external moulds of a left valve. There is also a distorted specimen, possibly of the same species, in the same piece of rock.

Locality and horizon. Matasafara, 15 miles W. of Mandera, N.E. Kenya ; uppermost Jurassic, Gudediye Beds.

Remarks. Compared with the " *Tancredia* sp.A " of the Golberobe Beds (Oxfordian) of N.E. Kenya and with the *Tancredia* from the Oxfordian of Cordebugle, Calvados, France, figured by Chavan (1952 : 106, pl. 4, figs. 48–50) as *Corbicella* (*Corbicellopsis*) *autissiodorensis* (Cotteau), this species is a little less elongated. It is very close to the European Bathonian species *T. extensa* Lycett, as figured (under the name *T. axiniformis* (Phillips)) by Morris & Lycett (1855, pl. 12, fig. 7 especially), but has a more strongly convex ventral margin.

Family **QUENSTEDTIIDAE** Cox 1929

Genus ***QUENSTEDTIA*** Morris & Lycett 1855

Quenstedtia saggersoni sp. nov.

Pl. 19, figs. 4, 6

Specific name. After Mr. E. P. Saggerson, of the Kenya Geological Survey.

Diagnosis. Of medium size, oblong, well elongated, with length (35 mm. in holotype) exceeding twice the height ; only slightly inequilateral, with broadly rounded, slightly protruding umbo just anterior to mid-length. Posterior margin feebly convex, a little oblique in its general direction, joining the straight, parallel postero-dorsal and ventral margins in even curves ; anterior margin strongly and evenly convex.

Holotype and paratype. Holotype, no. L.93600. One paratype, no. L.93636.

Localities and horizon. Ogar Wein, 17 miles N.W. of Wergudud, N.E. Kenya (type-locality) ; Korkai Hammassa, 19 miles E. of Takabba, N.E. Kenya ; both Oxfordian, Golberobe Beds.

Remarks. This species is rather closely comparable to *Q. elongata* Hudleston, an English Oxfordian species figured by Arkell (1934*a* : 298, pl. 40, figs. 6, 7), but is not quite so inequilateral. It is more elongate and less inequilateral than *Q. laevigata* (Phillips), another Oxfordian species figured by Arkell (1934*a* : 296, pl. 40, figs. 4, 5).

Quenstedtia jouberti sp. nov.

Pl. 19, fig. 5

1960. *Quenstedtia* sp ; Joubert, pl. 10, fig. 1.

Specific name. After Mr. P. Joubert, of the Kenya Geological Survey, collector of the holotype.

Diagnosis. Moderately large for the genus (length of holotype 60 mm. +), rather pronouncedly inequilateral ; umbones broadly rounded, projecting very slightly above dorsal margins, and placed at anterior third of length. Postero-dorsal margin straight, forming an obtuse angle with posterior margin, which merges with ventral margin in a broad curve ; ventral margin straight, diverging slightly from postero-dorsal margin in a posterior direction ; antero-dorsal outline moderately excavated ; anterior margin (damaged in holotype) apparently evenly rounded. An obtuse ridge runs from the umbo to the postero-ventral corner of the shell.

Holotype. No. L.92213. The only specimen.

Locality and horizon. N. of Figfirya, northern Raiya hills, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

Remarks. This species is less elongate and more strongly inequilateral than *Q. gortanii* Venzo (1949 : 159, pl. 16, fig. 27), the most closely comparable of the five representatives of the genus described by this author from the late Jurassic beds at Cud Finagubi, in northern Kenya. It is much more inequilateral than the English Portlandian species *Q. portlandica* Cox (1929 : 191, pl. 6, figs. 5, 6).

Superfamily **MYACEA**

Family **CORBULIDAE** Gray 1823

Genus ***CORBULA*** Bruguière 1797

Corbula didimtuensis sp. nov.

Pl. 19, figs. 10, 11*a*, *b*, *c*

Diagnosis. Moderately large for the genus (length of largest specimen 24 mm.), subrectangular with a triangular tendency, very slightly inequilateral, not rostrate posteriorly ; height two-thirds to three-quarters of length ; beaks slightly anterior to median ; inequivalve, right valve larger but only slightly more inflated than left ; most inflated part of each valve lying anterior to umbones. Right umbo rather broadly rounded, prominent, higher than more narrowly rounded umbo of left valve ; both are slightly incurved to the feebly prosogyrous beaks. Umbonal outline in right valve rising slightly above the straight, gently inclined postero-dorsal margin, which forms an acute angle with the slightly oblique posterior margin ; the latter curves round below to merge with the straight or feebly convex ventral margin. Antero-dorsal outline very feebly concave, steeply sloping ; anterior margin rounded, feebly convex. In right valve a narrow and very shallow sulcus runs in some specimens from the umbo to meet the ventral margin near its posterior extremity, while a second narrow sulcus, scarcely perceptible, runs down the posterior slope from behind the umbo to the point where the posterior and ventral margins meet. In left valve a rounded-off anterior beak ridge is present in early growth-stages. There is no impressed lunule in either valve. Both valves are ornamented with fine and irregular concentric threads, and irregular concentric undulations may also be present ; radial ornament lacking.

Holotype and paratypes. Nos. LL.35073 and LL.35074–75 respectively, three specimens in all.

Locality and horizon. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

Remarks. This large *Corbula* does not closely resemble any Jurassic species hitherto described. It is rather like the well-known Eocene species *C. gallica* Lamarck, differing in its flatter ventral margin and somewhat smaller size.

Corbula mandawaensis sp. nov.

Pl. 19, figs. 7*a*, *b*, 8*a*, *b*

Diagnosis. Of medium size for the genus (length of holotype 5·6 mm., of largest specimen c. 9·0 mm.), trigonally ovate, rather strongly inequilateral, carinate but not rostrate posteriorly, height two-thirds of length, beaks at anterior third to quarter of length ; probably very slightly inequivalve (all specimens retaining both valves in position have, however, suffered distortion by compression) ; inflation moderate. In both valves, umbo broadly rounded, well incurved to the rather strongly prosogyrous beak ; umbonal outline rising well above the straight, gently inclined postero-dorsal margin, which forms an obtuse angle with the very oblique, straight posterior margin ; ventral margin evenly and rather feebly convex ; antero-dorsal outline slightly concave, steeply sloping ; anterior margin of moderate convexity ; a well-marked, sigmoidal diagonal ridge delimits a flattened or concave posterior area. Ornament consisting of fine, regular concentric threads present on the flank but not on the posterior area.

Holotype and paratypes. Holotype, no. LL.35148 ; several paratypes, including nos. LL.35147, LL.35149, but many are imperfect or crushed. All *ex* B.P. Coll.

Locality and horizons. Mandawa well no. 6, Tanganyika, at depths 46–48 feet (holotype), 48–50 feet, 50–52 feet, 52–54 feet, 54–56 feet, 56–58 feet, 58–60 feet, 62–64 feet, 64–66 feet, 70–72 feet ; Bajocian (?).

Remarks. In the two French Bajocian species *C. aglaia* d'Orbigny and *C. alimena* d'Orbigny (types figured by Thevenin, 1911*a*, pl. 26, figs. 34 and 36, 37 respectively), which may be synonymous with one another, the truncated posterior end of the shell is lower and the concentric ornament less regular than in the new species.

Corbula tanganyicensis sp. nov.

Pl. 19, figs. 9*a*, *b*, 12*a*, *b*, *c*, *d*

Diagnosis. Rather small (length of largest specimen c. 5 mm.), trigonally ovate, slightly inequilateral, some specimens subrostrate posteriorly, height two-thirds of length, beaks situated between anterior third and middle of length ; very slightly inequivalve, left valve slightly the lower, with its ventral margin overlapped by that of right valve, but scarcely differing from the latter in its moderately strong inflation. In both valves, umbo broadly rounded, well incurved to the rather strongly prosogyrous beak ; umbonal outline rising well above the straight, gently inclined, and in some specimens relatively short postero-dorsal margin ; ventral margin strongly convex anteriorly, flattened or sinuate posteriorly ; antero-dorsal outline slightly concave, steeply sloping ; anterior margin of varying convexity ; a well-defined, sigmoidal diagonal ridge delimits a concave posterior area. Ornament consisting of fine, regular concentric riblets present on flank but not on posterior area.

Holotype and paratypes. Holotype, no. LL.35150 ; several paratypes, including no. LL.35151. All *ex* B.P. Coll.

Locality and horizons. Mandawa well no. 7, Tanganyika, at depths 3760–3770 feet and 4510–4520 feet (holotype) ; Bajocian (?).

Remarks. This species is smaller and slightly more gibbose than *C. mandawaensis*, and also differs in its narrower, commonly rostrate posterior extremity and in its rather coarser concentric ornament.

Corbula pindiroensis sp. nov.

Pl. 19, figs. 14*a*, *b*, *c*, 15*a*, *b*

Diagnosis. Of medium size for the genus (length of largest specimen c. 13 mm.), trigonally ovate, slightly to moderately inequilateral, not rostrate posteriorly, height about two-thirds of length, beaks at anterior two-fifths to third of length ; rather strongly inflated, apparently sub-equivalve (all specimens, however, have suffered some distortion by compression). In both valves, umbo very broadly rounded, well incurved to the moderately prosogyrous beak ; umbonal outline rising only slightly above the feebly concave postero-dorsal outline, which forms a slightly obtuse angle with the straight, low, slightly oblique posterior margin ; ventral margin of rather strong convexity, straightened and upturned at its posterior end ; anterior margin strongly convex ; antero-dorsal outline slightly concave ; a sharply angular, sigmoidal diagonal ridge delimits a narrow, concave posterior area. Ornament of strong, unequal, unevenly arranged concentric riblets and threads on flank, and finer growth threads on posterior area.

Holotype and paratypes. Holotype, no. LL.35152 ; about 16 paratypes, including no. LL.35153, and mostly very imperfect. All *ex* B.P. Coll.

Locality and horizons. Pindiro well no. 1, Tanganyika, at depths 162–166 feet, 166–170 feet (holotype), 170–174 feet, 174–178 feet, 178–180 feet, 194–198 feet, 250–254 feet ; Bajocian (?).

Remarks. This species does not closely resemble any corbulid previously described from the Middle Jurassic. The English Bathonian form *C. attenuata* Lycett (1863 : 62, pl. 37, figs. 6, 6*a*) is more elongate, with a broader and less prominent umbo.

Corbula kidugalloensis sp. nov.

Pl. 19, figs. 17*a*, *b*, *c*

Diagnosis. Of medium size for the genus (length of holotype 11·2 mm.), pyriform, with a short posterior rostrum, subequivalve, gibbose ; height equal to about three-quarters of length. Umbones broadly rounded, prominent, almost median in position, well incurved to the prosogyrous beaks. Lunular region well impressed. Antero-dorsal outline slightly concave, sloping steeply to the evenly rounded anterior end of the shell. Ventral margin asymmetrically and rather strongly convex, with a small sinus (indicated by the growth-lines, this part of the actual margin being a little imperfect) at the beginning of the pointed rostrum. Postero-dorsal outline almost straight, sloping steeply ; posterior umbonal ridges weak, sigmoidally curved. Ornament consisting in early stages of growth of regularly arranged, narrow concentric riblets, separated by broader intervals ; in later growth-stages these are replaced by irregular rugae.

Holotype. No. LL.35154, *ex* B.P. Coll. The only specimen.

Locality and horizon. Magole, 5 miles N.W. of Kidugallo, Tanganyika ; Bajocian.

Remarks. Its much larger size distinguishes this species from *Corbula tanganyicensis* sp. nov., which is very similar in shape.

Corbula eamesi sp. nov.

Pl. 19, figs. 19*a*, *b*, *c*

Specific name. After Dr. F. E. Eames, Chief Palaeontologist of the British Petroleum Co., Ltd.

Diagnosis. Of large-medium size for the genus, pyriform but not distinctly rostrate posteriorly, length (16 mm.) exceeding one and a half times the height (which may, however, have been somewhat reduced by distortion) ; fairly strongly inflated, subequivalve. Umbones broadly rounded, situated at about anterior third of length, and well incurved to the prosogyrous beaks. Lunular region well impressed. Antero-dorsal outline slightly concave, sloping steeply to the low, abruptly rounded anterior end of the shell. Ventral margin asymmetrical, moderately convex anteriorly, flattened posteriorly except at extreme end, which bends up sharply to the angular posterior extremity of shell. Postero-dorsal outline moderately convex except posteriorly, where the actual dorsal margin emerges from behind the umbonal profile. Posterior margin short, straight, very oblique, forming obtuse angle with postero-dorsal margin. Posterior umbonal ridges well defined, sigmoidal. Ornament consisting of rounded concentric riblets separated by much narrower intervals and regularly spaced in all stages of growth.

HOLOTYPE. No. LL.35155, *ex* B.P. Coll. The only specimen.

LOCALITY AND HORIZON. 6 miles N.W. of Kidugallo, Tanganyika ; Bajocian.

REMARKS. In shape this species, with its gradual posterior taper, bears a very slight resemblance to the German Bajocian species *C. involuta* Münster (in Goldfuss, 1840 : 250, pl. 151, figs. 14*a*, *b*), which needs re-describing on the basis of additional material. It differs from Goldfuss's type-specimen (re-illustrated by Kuhn, 1938 : 142, pl. 5, fig. 7), which is 10 mm. long, in its larger size, its more elongate outline, and its much stronger inflation.

Corbula asaharbitensis sp. nov.

Pl. 19, figs. 18*a*, *b*

DIAGNOSIS. Rather small (length of holotype 5·5 mm.), subtrigonal, well elongated, height about three-fifths of length ; inflation moderate ; whether equivalve or not uncertain. Umbones not prominent, just posterior to mid-length, slightly opisthogyrous ; an umbonal ridge present in each valve, crossing shell to ventral margin with slight posterior inclination. Posterior end of valves, beyond the umbonal ridge, compressed and subrostrate, tapering to a narrow extremity and with slightly concave dorsal margin and almost straight ventral margin. Antero-dorsal outline feebly convex, gently sloping ; anterior margin evenly rounded, curved in continuity with the ventral margin, which is strongly convex along the anterior half of its length. Surface of shell anterior to the umbonal ridge ornamented with evenly spaced concentric ridges crossed by radial threads, forming a reticulate pattern ; posterior end of shell ornamented with radial riblets only, about 8 in number. The ornament is similar on the two valves.

HOLOTYPE AND PARATYPES. Holotype, no. LL.13230 ; several paratypes.

LOCALITY AND HORIZON. 1 mile N. of Asaharbito, N.E. Kenya ; Bathonian [? or Callovian], Asaharbito Beds.

REMARKS. Before the more complete specimens had been extracted from the matrix it was thought that this species might be related to the European Bathonian form *Corbula hulliana* Morris, but it is much more elongate than that species and also differs in the presence of radial ornament on both valves. It is a little like the Kimmeridgian species *Corbula vomer* Contejean (1860 : 254, pl. 10, figs. 29, 30), but is very much smaller and differs considerably in the direction of its umbonal ridge.

Corbula kailtaensis sp. nov.

Pl. 19, figs. 13*a*, *b*

DIAGNOSIS. Of medium size for the genus (length of holotype 9·6 mm.), pyriform, height two-thirds of length. Left (and only known) valve gibbose, with a short, narrow posterior rostrum ; umbo broadly rounded, prominent, slightly anterior to mid-length ; antero-dorsal outline very slightly concave, sloping steeply to the broadly rounded anterior extremity of the shell ; ventral margin strongly convex, symmetrical except for a broad, ill-defined sinus at the beginning of the posterior rostrum ; postero-dorsal outline parasigmoidal ; no distinct umbonal ridge. Ornament consisting of narrow and slightly unevenly spaced concentric riblets.

HOLOTYPE. No. L.92036. The only specimen.

LOCALITY AND HORIZON. Kailta, Golberobe hills, N.E. Kenya ; Oxfordian, Golberobe Beds.

REMARKS. This species rather closely resembles *Corbula buckmani* Lycett (1863 : 63, pl. 37, fig. 8), from the Bathonian of England, but in that species there is an oblique posterior margin which forms an obtuse angle with the hinge-margin, and the narrow posterior rostrum characteristic of the present form is lacking. *C. glosensis* Zittel & Goubert (figured Chavan 1952, pl. 4, figs. 76–79), from the Upper Oxfordian of Cordebugle, Calvados, France, is not so distinctly rostrate.

Superfamily **PHOLADOMYACEA**

Family **PHOLADOMYIDAE** Gray 1847

Genus ***PHOLADOMYA*** G. B. Sowerby 1823

Pholadomya reticulata Agassiz

Pl. 20, fig. 2

1842. *Pholadomya reticulata* Agassiz : 80, pl. 4, figs. 4–6 ; pl. 4*c*, figs. 1–4.
1874. *Pholadomya reticulata* Ag. ; Moesch : 28, pl. 9, figs. 2, 4, 5, 9–11.
1893. *Pholadomya reticulata* Ag. ; Choffat : 11, pl. 4, figs. 4–7.
1929. *Pholadomya reticulata* Ag. ; Lanquine : 203, pl. 7, fig. 8.

MATERIAL. Three specimens (nos. LL.35076–78).

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. The largest specimen, the original length of which was slightly more than 25 mm., is much eroded, but the smaller specimen illustrated is ornamented with rather coarse concentric folds crossed by narrow radial riblets which are present on all parts of the shell. There is close agreement with the illustrations cited above. This relatively small *Pholadomya* was originally described from beds of Upper Liassic age. Its range extends, according to Moesch, into the Bajocian.

Pholadomya lirata (J. Sowerby)

Pl. 20, fig. 8

1818*a*. *Cardita? lirata* J. Sowerby : 220, pl. 197, fig. 3.
1910. *Pholadomya carinata* Goldfuss ; Dacqué : 31, pl. 5, fig. 7.
1916. *Pholadomya carinata* Goldfuss ; Douvillé : 55, pl. 6, fig. 8.
1935*a*. *Pholadomya lirata* (J. Sowerby) ; Cox : 190, pl. 21, figs. 8, 9.
1939. *Pholadomya carinata* Goldfuss ; Stefanini : 259, pl. 27, fig. 2.
1948. *Pholadomya lirata* (J. Sowerby) ; Cox & Arkell : 43.
1960. *Pholadomya lyrata* J. de C. Sowerby ; Joubert, pl. 11, fig. 6.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Kidugallo Station and 1¼ miles to the east, Central Railway, Tanganyika ; Bajocian, Station Beds. 2 miles E. of Magindu Station, Central Railway, Tanganyika ; Callovian. 3 miles W. of Melka Biini, N.E. Kenya ; Callovian, Rukesa Shales.

REMARKS. This widespread species was discussed by me in 1935. The earlier authors who recorded it from East Africa cited it under the name *P. carinata* Goldfuss.

Pholadomya ovalis (J. Sowerby)

Pl. 20, fig. 1

1819*a*. *Lutraria ovalis* J. Sowerby : 47, pl. 226, fig. 1 only.
1842. *Pholadomya ovulum* Agassiz : 119, pl. 3, figs. 7–9 ; pl. 3*b*, figs. 1–6.
1874. *Pholadomya ovulum* Agassiz ; Moesch : 48, pl. 20, figs. 1–11.
1910. *Pholadomya angustata* (Sow.) ; Dacqué : 32, pl. 5, fig. 8 (*non* Sowerby sp.).
1929. *Pholadomya protei* (Brongniart) ; Weir : 33, pl. 3, fig. 10 (*non* Brongniart sp.).
1948. *Pholadomya ovalis* (J. Sowerby) ; Cox & Arkell : 44.
1960. *Pholadomya ovalis* (J. Sowerby) ; Joubert, pl. 11, figs. 8*a*, *b*.

MATERIAL. Two specimens (nos. L.98277, L.92075).

LOCALITIES AND HORIZONS. Hagardulun, 25 miles N.E. of Tarbaj, N.E. Kenya ; Bathonian–Callovian, Bur Mayo Limestones. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Pholadomya protei (Brongniart)

1821. *Cardium protei* Brongniart : 554, pl. 7, figs. 7*a–c*.
1872. *Pholadomya protei* (Brongniart) ; de Loriol : 169, pl. 10, figs. 13–15.
1875. *Pholadomya protei* (Brongniart) ; Moesch : 79, pl. 30, figs. 1, 2.
1935*a* *Pholadomya protei* (Brongniart) ; Arkell : 333, pl. 46, figs. 8, 9 ; pl. 47, figs. 1–4.
1939. *Pholadomya protei* (Brongniart) ; Stefanini : 263, pl. 27, figs. 6–8.

MATERIAL. One specimen (no. LL.11807).

LOCALITY AND HORIZON. Just W. of Mabokweni, 4 miles N.W. of Tanga, Tanganyika ; Kimmeridgian.

REMARKS. This species, which has been misidentified by some authors, is characterized by its relatively short outline and by its small number (3–6) of costae, which are closely arranged on the middle of the shell, the most anterior one standing out as a sharp keel. Although its posterior end is broken away, the specimen now recorded seems to be a very typical example of the species. The specimens from Somaliland figured as *P. protei* by Dacqué (1905 : 140, pl. 15, figs. 1–3) and one from Rukesa, N. Kenya, considered by Weir (1929 : 33, pl. 3, fig. 10) to be a young individual of the species, were wrongly identified.

Pholadomya hemicardia Roemer

Pl. 20, fig. 5

1836. *Pholadomya hemicardia* Roemer : 131, pl. 9, fig. 18.
1874. *Pholadomya hemicardia* Roemer ; Moesch : 58, pl. 23, figs. 1–6 ; pl. 24, fig. 11.
1935*a*. *Pholadomya hemicardia* Roemer ; Arkell : 336, pl. 46, figs. 5–7.
1960. *Pholadomya hemicardia* Roemer ; Joubert, pl. 11, figs. 5*a*, *b*.

MATERIAL. Two specimens (nos. L.92186, LL.35156).

LOCALITIES AND HORIZONS. Mandawa–Lonji creek traverse, Mandawa area, Tanganyika ; Upper Oxfordian. Hegalu hills, 2 miles N. of Finno, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

REMARKS. The more complete specimen is 33 mm. long, with the posterior end of the shell rather angular and situated above mid-height. The ornament consists of weak, irregular concentric undulations crossed by weak radial riblets, which are scarcely perceptible on the posterior part of the surface. The specimens appear to fall within the range of variation of *P. hemicardia*, which in Europe occurs in the Oxfordian and Kimmeridgian.

Genus ***HOMOMYA*** Agassiz 1843

Homomya inornata (J. de C. Sowerby)

1840*b*. *Pholadomya? inornata* J. de C. Sowerby : 327, pl. 21, fig. 8.
1874. *Pholadomya inornata* Sowerby ; Moesch : 53.
1907*a*. *Pholadomya inornata* Sowerby ; Cossmann : 134, pl. 1, fig. 17.
1912. *Pholadomya inornata* Sowerby ; Lissajous : 92, pl. 11, fig. 21.
1921. *Pholadomya inornata* Sowerby ; de la Bouillerie : 35, pl. 4, fig. 10.
1924. *Pholadomya* (*Flabellomya*) *ovulum* Agassiz ; Cossmann : 53, pl. 7, figs. 3–8 (*non* Agassiz).

MATERIAL. One specimen (no. L.92154).

LOCALITY AND HORIZON. 3½ miles W. of Melka Biini, N.E. Kenya. Callovian, Rukesa Shales.

REMARKS. This species, which is ornamented with concentric ribs undulating slightly in places and may also bear a few faint radial threads (actually just visible on Sowerby's holotype), was described originally from the Callovian of India. It has been recorded by authors cited above from the Callovian of France. Cossmann (1924), however, has suggested that the French specimens would be more correctly identified as *Pholadomya ovulum* Agassiz (= *P. ovalis* (J. Sowerby)). This view is not here accepted. Although radial ornament is relatively weak and variable in *P. ovalis*, it is more distinct than in any specimens which have been recorded as *P. inornata*, a species which it seems preferable to include in *Homomya*. The African fossil now recorded is imperfect, but agrees well with typical specimens from India.

Homomya rahmuensis sp. nov.

Pl. 20, figs. 3*a*, *b*

1960. *Homomya* sp. nov. ; Joubert, pl. 11, figs. 9*a*, *b*.

Diagnosis. Small for the genus (length of holotype 43 mm.), oblong-ovate, height about three-fifths of length ; inflation moderate (22 mm. in holotype) and even, greatest at about mid-length ; posterior gape narrow. Umbones rather narrow, protruding only slightly, placed at about the anterior fifth of the length ; posterior umbonal ridge, bordering a rather broad but shallow escutcheon, ill-defined except near the umbones. Postero-dorsal and ventral margins straight, elongate, sub-parallel. Posterior margin of feeble convexity, sub-vertical in its general direction. Ornament consisting of weak, irregular concentric folds.

Holotype. No. L.92260. The only specimen.

Locality and horizon. Uacha, 6 miles S. of Rahmu, N.E. Kenya. Oxfordian, Rahmu Shales.

Remarks. This species is comparable to *H. censoriensis* (Cotteau) (Peron, 1906 : 43, pl. 1, fig. 1), Oxfordian of France, but is not so high at its posterior end. *H. corallina* de Loriol (1894*a* : 80, pl. 6, figs. 1, 1*a*), Lower Kimmeridgian of France, is more gibbose and slightly less elongate.

Homomya hortulana Agassiz

Pl. 20, fig. 4

1843. *Homomya hortulana* Agassiz : 155, pl. 15.
1872. *Pholadomya hortulana* (Agassiz); de Loriol : 166, pl. 10, fig. 16.
1893. *Pholadomya* (*Homomya*) *hortulana* (Agassiz) ; Choffat : 33, pl. 9, figs. 2–6.
1933. *Homomya* cf. *hortulana* Agassiz ; Dietrich : 55, pl. 7, fig. 104.

Material. Three specimens.

Localities and horizons. N. of Kipande, Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinella* Bed. Mtapaia road, Tendaguru ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

Remarks. The prominence of the umbones varies considerably in European specimens of this species. They are very broad and depressed in the East African specimens now recorded, but these can be matched with published figures of specimens from Europe, and it seems unnecessary to follow Dietrich in qualifying their specific identification.

Genus ***GONIOMYA*** Agassiz 1841

Goniomya trapezicostata (Pusch)

Pl. 21, figs. 2, 3

1836. *Lutraria trapezicostata* Pusch : 80, pl. 8, figs. 10*a–c*.
1840. *Lysianassa ornata* Münster ; Goldfuss : 264, pl. 154, fig. 12.
1842. *Goniomya inflata* Agassiz : 20, pl. 1, fig. 15.
1852. *Pholadomya trapezina* Buvignier : 8, pl. 8, figs. 14–18.
1900. *Goniomya* cf. *trapezina* (Buvignier) ; Müller : 536, pl. 18, figs. 2, 2*a*.
1924. *Goniomya trapezicostata* (Pusch) ; Cossmann : 51, pl. 7, figs. 9, 10.

MATERIAL. Two specimens (nos. L.54080, LL.35157), the second *ex* B.P. Coll.

LOCALITIES AND HORIZONS. 1¼ miles E. of Kidugallo Station, Central Railway, Tanganyika. Bajocian. ½ mile N.W. of bridge over Mkulumuzi river, 2 miles W. of Tanga, Tanganyika ; Callovian.

REMARKS. In this species the steep oblique ribs on the anterior and posterior parts of the surface are separated in all stages of growth by a horizontal rib, instead of meeting to form a series of V's, as in most species of the genus. In the specimen of Bajocian age now recorded the intervening horizontal ribs are shorter than in the Callovian specimen, which agrees better with the typical *G. trapezicostata*. The difference, however, does not seem important enough to justify its specific separation. In Europe *G. trapezicostata* occurs in the Callovian and Oxfordian.

Goniomya literata (J. Sowerby)

1819*a*. *Mya? literata* J. Sowerby : 45, pl. 224, fig. 1.
1819*a*. *Mya v. scripta* J. Sowerby : 46, pl. 224, figs. 2–5.
1935*a*. *Goniomya literata* (Sowerby) ; Arkell : 344, pl. 48, figs. 1–7.
1939. *Goniomya literata* (Sowerby) ; Stefanini : 254, pl. 26, figs. 3*a*, *b*.

MATERIAL. One specimen (no. LL.16846).

LOCALITY AND HORIZON. Scarp face, eastern margin of Makoko plain, Bagamoyo hinterland, Tanganyika ; Oxfordian.

REMARKS. In this specimen the convergent oblique ribs almost die out at mid-growth, particularly on the posterior part of the surface. In this respect the specimen agrees with *G. marginata* Agassiz, as interpreted by de Loriol (1872 : 187, pl. 12, figs. 3, 4) and Boden (1911 : 58, pl. 6, figs. 2, 2*a*), although it is to be noted that Agassiz's (1842, pl. 1, figs. 12–14 ; pl. 1*c*, fig. 15) original figures of *G. marginata* do not show this fading away of the ribs. Arkell (1935*a* : 346) was of the opinion that *G. marginata*, even as interpreted by the authors cited, is inseparable from *G. literata*.

Genus ***OSTEOMYA*** Moesch, 1874

Osteomya dilata (Phillips)

1829. *Mya dilata* Phillips : 155, pl. 11, fig. 4.
1855. *Myacites dilatus* (Phillips) ; Morris & Lycett : 114, pl. 10, figs. 5*a*, *b*.

1923. *Goniomeris dilatata* (Phillips); Lissajous: 195, pl. 32, figs. 2–5.
1948. *Osteomya dilata* (Phillips); Cox & Arkell: 45.

MATERIAL. Two specimens (nos. LL.11566–7).

LOCALITY AND HORIZON. Kidugallo Station, Central Railway, Tanganyika. Bajocian, Station Beds.

REMARKS. Although distorted, the specimens now recorded are unmistakable examples of this species. Its range in Europe is from Bajocian to Callovian. It has been recorded from the Bajocian of Madagascar, but not from East Africa previously.

Family **MYOPHOLADIDAE** Cox 1964

Genus ***MYOPHOLAS*** Douvillé 1907

Myopholas manderaensis sp. nov.

Pl. 19, fig. 20

1960. *Myopholas* sp. nov.: Joubert, pl. 11, fig. 10.

DIAGNOSIS. Rather small for the genus, elongate-ovate, with the length (31 mm. in the holotype) about 2½ times the height (12 mm.). Inflation only moderate, but possibly diminished in the course of fossilization. Umbo very broadly rounded, placed at about the anterior third of the length, and not protruding above the postero-dorsal margin, which slopes gradually towards the narrowly rounded posterior extremity. Ventral margin with a broad and very shallow median sulcus. Ornament of anterior two-thirds of surface consisting of 23 narrow radial ribs, the most anterior three of which are separated by relatively broad intervals and the remainder by much narrower ones. The most posterior of these ribs stands out slightly more prominently than the others; the posterior third of the surface, lying beyond it, bears a few ribs which are just visible in the earlier growth-stages and then fade away partly or completely, leaving the surface almost smooth.

HOLOTYPE. No. L.92271, the external mould of a right valve. There are also two very imperfect specimens.

LOCALITY AND HORIZON. Matasafara, 15 miles W. of Mandera, N.E. Kenya; uppermost Jurassic, Gudediye Beds.

REMARKS. The virtual absence of ribbing on the posterior third of the surface distinguishes this species from the European Upper Jurassic forms *Myopholas multicostata* (Agassiz) and *M. percostata* Douvillé (Douvillé, 1907*b*, pl. 2, figs. 6, 7 and figs. 4, 5 respectively) and is more suggestive of the Neocomian shell *M. semicostata* (Agassiz) (Douvillé, 1907*b*, pl. 2, fig. 8), which, however, has fewer costae on the anterior part of its surface.

Family **PLEUROMYIDAE** Dall 1900

Genus ***PLEUROMYA*** Agassiz 1845

Pleuromya didimtuensis sp. nov.
Pl. 19, fig. 16

Diagnosis. Of small-medium size (length of largest specimen c. 24 mm.), subovate, somewhat projecting postero-dorsally and with subrostrate anterior end ; inequilateral, height about two-thirds of length, beaks at anterior third of length ; shell well inflated mesially, but somewhat compressed postero-dorsally. Umbones broadly rounded, well incurved to the beaks, which are moderately prosogyrous. Postero-dorsal margin feebly convex, subhorizontal, forming a slightly acute angle with the backward-sloping posterior margin ; ventral margin strongly convex posteriorly, where it joins the posterior margin, flattened and slightly convergent with the postero-dorsal outline anteriorly ; antero-dorsal outline feebly concave, steeply sloping ; anterior margin low, strongly convex. Ornament consisting of narrow, rounded concentric ribs, a little sinuous and irregular in places. Internal characters not observable.

Holotype and paratypes. Nos. LL.35079 and LL.35080–81 respectively, three specimens in all.

Locality and horizon. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

Remarks. Owing to erosion the specimens do not clearly show the projecting postero-dorsal corner of the shell, which is one of its most distinctive characters, but this can be restored by studying the growth-lines. In this feature the present species resembles *Pteromya tatei* (Richardson & Tutcher) (1916 : 52, pl. 8, figs. 3*a*–*c*), from the basal Hettangian of England, but that species is larger and has a more strongly convex ventral margin.

Pleuromya uniformis (J. Sowerby)
Pl. 20, fig. 6

1813*a*. *Unio uniformis* J. Sowerby : 83, pl. 33, fig. 4.
1900. *Pleuromya tellina* Agassiz ; Müller : 536, pl. 18, figs. 3–5.
1914*b*. *Pleuromya tellina* Agassiz ; Hennig : 168, pl. 14, fig. 5.
1935*a*. *Pleuromya uniformis* (J. Sowerby) ; Arkell : 325, pl. 45, figs. 1–13.
1948. *Pleuromya uniformis* (J. Sowerby) ; Cox & Arkell : 40.

Material. Several specimens.

Localities and horizons. Scarp face, eastern margin of Makoko plain, Bagamoyo hinterland, Tanganyika ; Oxfordian. Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Indogrammatodon* bed.

Pleuromya calceiformis (Phillips)

Pl. 20, fig. 9

1829. *Mya calceiformis* Phillips : 155, pl. 11, fig. 3.
1863. *Myacites calceiformis* (Phil.); Lycett : 80, pl. 42, figs. 1, 1*a*.
1934*a*. *Pleuromya calceiformis* (Phil.) ; Arkell : 324, pl. 44, figs. 12, 12*a*.

MATERIAL. One specimen (no. LL.35158), *ex* B.P. Coll.

LOCALITY AND HORIZON. Mandawa–Lonji creek traverse, Mandawa area, Tanganyika ; Upper Oxfordian.

REMARKS. The specimen now recorded is in every way typical of the species. This has not been recorded previously from East Africa or from anywhere in the Indian Ocean region.

Family **CERATOMYIDAE** Arkell 1934

Genus ***CERATOMYA*** Sandberger 1864

Ceratomya tanganyicensis sp. nov.

Pl. 21, figs. 1*a*, *b*, *c*

DIAGNOSIS. Of medium size (length 41 mm.), ovate with a trigonal tendency, moderately inequilateral, height four-fifths of length, beaks at about anterior third of length ; shell well inflated mesially, somewhat compressed posteriorly. Umbones very broadly rounded, not prominent, well incurved to the beak, which was apparently not strongly prosogyrous for the genus, but is obscured in the only available specimen. Postero-dorsal outline very feebly convex, rather steeply sloping, joining the fairly sharply rounded posterior margin in an even curve ; ventral margin very strongly convex anteriorly, almost angular posteriorly, where it bends up to the narrowly rounded anterior end of the shell ; antero-dorsal outline very feebly concave. Ornament of numerous narrow, rounded, subequal concentric ribs, which number rather more than 20 to the cm.

HOLOTYPE. No. LL.35159. The only specimen.

LOCALITY AND HORIZON. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika ; Bajocian (?), Pindiro Shales.

REMARKS. The closeness of the concentric ribbing distinguishes this from all other post-Liassic species of the genus. In *C. madagascariensis* (Thevenin) (1908*b* : 28, pl. 3, figs. 9, 9*a*), from the Upper Lias of Madagascar, the shell is higher and less elongated.

Ceratomya concentrica (J. de C. Sowerby)

Pl. 20, fig. 7

1825*a*. *Isocardia concentrica* J. de C. Sowerby : 147, pl. 491, fig. 1.
1855. *Isocardia concentrica* Sowerby ; Morris & Lycett : 108, pl. 10, figs. 3*a*, *b* (*non* pl. 15, figs. 2*a*, *b*).

1863. *Ceromya concentrica* (Sowerby) ; Lycett, pl. 36, fig. 5.
1948. *Ceratomya concentrica* (Sowerby) ; Cox & Arkell : 41.
1960. *Ceratomya concentrica* (Sowerby) ; Joubert, pl. 10, figs. 9*a*, *b*.

MATERIAL. About four specimens.

LOCALITIES AND HORIZONS. 3½ miles W. of Melka Biini, N.E. Kenya ; Callovian, Rukesa Shales. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya ; Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

REMARKS. In the specimens on which the ornament is best preserved the concentric ribs are numerous and closely arranged, as in specimens from the Great Oolite of England. There is also an imperfect specimen from the Bajocian of Kidugallo, Tanganyika, which seems to be very similar to *C. concentrica* but is more coarsely ribbed. This may perhaps belong to the related species *C. bajociana* (d'Orbigny).

Ceratomya pittieri (de Loriol)

Pl. 21, fig. 4

1883. *Ceromya pittieri* de Loriol : 25, pl. 6, figs. 3, 4.
1910. *Ceromya concentrica* (Sow.) ; Dacqué : 33, pl. 5, fig. 6 only (*non* Sowerby sp.).

MATERIAL. One specimen (no. LL.35160), *ex* B.P. Coll.

LOCALITY AND HORIZON. Magindu, Central Railway, Tanganyika ; Callovian.

REMARKS. This specimen, which is 94 mm. long, is a well elongated *Ceratomya* with an almost terminal, only slightly protruding umbo which is strongly incoiled to the beak. A slight radial depression of the flank appears at mid-growth and terminates at the ventral margin near its anterior end. The ventral margin diverges gradually from the hinge-margin in a posterior direction. The surface ribs, although partly obliterated by erosion in places, can be seen to be regularly concentric and fairly closely arranged.

Except for the presence of the radial depression, the shape of the shell agrees with de Loriol's figures of *C. pittieri*, the type specimens of which came from the Callovian *Mytilus* Beds of the Alps of Vaud, Switzerland. The Abyssinian Kimmeridgian (?) species *C. paucilirata* (Blanford), especially as figured by Futterer (1897, pl. 22, fig. 1) also resembles the present specimen in shape, but its concentric ribs are not so closely arranged. These forms are very close to de Loriol's (1872, pl. 12, fig. 13) " var. *cylindrica* " of *C. excentrica*, an Upper Oxfordian-Kimmeridgian species highly variable in form and ornament. In view of the Callovian age of the specimen now recorded, however, it seems most satisfactory to identify it as *C. pittieri*.

Ceratomya wimmisensis (Gilliéron)

1883. *Ceromya concentrica* (Sowerby) ; de Loriol : 18, pl. 5, figs. 1–5 (*non* J. de C. Sowerby sp.).
1886. *Ceromya wimmisensis* Gilliéron : 141.
1918. *Ceromya wimmisensis* Gilliéron ; Gerber : 12, pl. 1, figs. 3–6.
1929. *Ceratomya wimmisensis* (Gilliéron) ; Weir : 31, pl. 3, fig. 2.

1929. *?Ceratomya* cf. *wimmisensis* (Gilliéron) ; Weir : 31, pl. 3, fig. 1.
1935*a*. *Ceratomya wimmisensis* (Gilliéron) ; Cox : 186, pl. 20, figs. 6*a*, *b*.
1939. *Ceratomya wimmisensis* (Gilliéron) ; Stefanini : 248, pl. 25, figs. 5, 6.

MATERIAL. One specimen (no. L.83881).

LOCALITY AND HORIZON. 14 miles W.S.W. of Rahmu, N.E. Kenya. Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

REMARKS. This specimen shows the abrupt discordancies in ribbing characteristic of this species, patches of oblique ribs occupying parts of the surface and concentric ribs the remainder. The arrangement of the ribbing is altogether dissimilar on the two valves. The specimen is not well enough preserved for illustration.

Ceratomya wilderriensis sp. nov.

Pl. 21, fig. 5

1960. *Ceratomya excentrica* (Roemer) ; Joubert, pl. 11, fig. 1 (*non* Roemer sp.).

DIAGNOSIS. Shell moderately large (length of holotype c. 87 mm.), ovate, with height about three-quarters of length, strongly inequilateral, evenly and moderately strongly inflated. Umbo terminal, strongly prosogyrous and incurved, its outline continuous with postero-dorsal outline of shell, which rises slightly above it before curving gently down to meet the evenly convex posterior margin. Ventral margin moderately and evenly convex. Umbonal ridges absent. Ornament consisting of closely and fairly evenly arranged, rounded concentric ribs (about 8 to the cm. on middle of shell), separated by narrower intervals.

HOLOTYPE AND PARATYPE. Nos. L.92226 and L.92246 respectively, two specimens in all.

LOCALITIES AND HORIZON. Dussé, 1½ miles S.E. of Rahmu, N. Kenya (type-locality). Wilderri hill, 11 miles S.S.W. of Rahmu. Both Upper Oxfordian, Seir Limestones.

REMARKS. This species, with its purely concentric ornament, belongs to the group of *Ceratomya concentrica* (J. de C. Sowerby), differing from that species in the terminal position of its umbo, in the even convexity of its surface (the postero-dorsal region is not in the least pinched-in), and in its larger size. In *C. paucilirata* (Blanford) (1870 : 203, pl. 8, fig. 6 ; also Futterer 1897 : 610, pl. 22, fig. 1), Upper Jurassic of S. Abyssinia, the umbo is more prominent and less anteriorly placed, the postero-dorsal region is not so evenly convex, and the concentric ribs are broader. In *C. egerkingensis* (Gerber) (1918 : 6, pl. 1, fig. 1), Lower Kimmeridgian of Switzerland, the umbo is much more prominent and less anteriorly placed.

Ceratomya excentrica (Roemer)

Pl. 20, fig. 10

1836. *Isocardia excentrica* Voltz MS. ; Roemer : 106, pl. 7, figs. 4*a–c*.
1842. *Ceromya excentrica* (Voltz) ; Agassiz : 28, pls. 8*a–c*.
1897. *Ceromya excentrica* (Voltz) ; Agassiz ; Futterer : 608, pl. 22, figs. 2, 2*a*.
1929. *Ceratomya excentrica* (Weir) (*sic*) ; Weir : 31, pl. 3, fig. 4.
1934*a*. *Ceratomya excentrica* (Roemer) ; Arkell : 316, pl. 43, figs. 11, 12.
1939. *Ceratomya excentrica* (Voltz) ; Stefanini : 249, pl. 25, fig. 7.
1960. *Ceratomya excentrica* (Roemer) ; Joubert, pl. 10, figs. 10*a*, *b* (*non* pl. 11, fig. 1).

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya ; Kimmeridgian, Hereri Shales. 1 mile S.S.W. of Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

REMARKS. The specimens now recorded are typical in every way, showing coarse ribs with various degrees of obliquity.

Superfamily **PANDORACEA**

Family **THRACIIDAE** Stoliczka 1870

Genus ***THRACIA*** Leach 1823

Thracia lens (Agassiz)

Pl. 21, fig. 8

1845. *Corimya lens* Agassiz : 267, pl. 36, figs. 1–15.
1912. *Corymya lens* Ag. ; Lissajous : 103, pl. 12, fig. 21.
1926. *Thracia* aff. *lenti* Ag. ; Schmidtill : 82, pl. 11, figs. 20*a*, *b*.

MATERIAL. One specimen (no. LL.35161), *ex* B.P. Coll.

LOCALITY AND HORIZON. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika ; Bajocian (?), Pindiro Shales.

REMARKS. This specimen, which is about 28 mm. long, agrees well with the original figures of the species in its elliptical outline, its broadly rounded, depressed umbo lying well posterior to mid-length, its evenly convex, gently sloping postero-dorsal outline, and its evenly concave, gently sloping antero-dorsal outline. The right valve is crushed. This species was originally described from the Bajocian of Switzerland and has been recorded from the Bathonian of France, Germany, and Sardinia.

Thracia viceliacensis d'Orbigny

Pl. 21, fig. 9

1850*a*. *Thracia viceliacensis* d'Orbigny : 306.
1906. *Thracia viceliacensis* d'Orb. ; Cossmann : 288, pl. 2, figs. 14–19.
1911*a*. *Thracia viceliacensis* d'Orb. ; Thevenin : 134, text-fig.
1911. *Thracia viceliacensis* d'Orb. ; Flamand : 903, pl. 11, figs. 17*a*, *b*.

1912. *Thracia viceliacensis* d'Orb. ; Lissajous : 102, pl. 12, fig. 20.
1916. *Thracia viceliacensis* d'Orb. ; Douvillé : 56, pl. 6, fig. 9.
1925. *Thracia viceliacensis* d'Orb. ; de la Bouillerie : 89, pl. 9, fig. 4.
1935*a*. *Thracia viceliacensis* d'Orb. ; Cox : 190, pl. 20, fig. 5.
1939. *Thracia viceliacensis* d'Orb. ; Stefanini : 266, pl. 27, figs. 9, 10.

MATERIAL. One specimen (no. LL.35162), *ex* B.P. Coll.

LOCALITY AND HORIZON. Lonji creek, W. of Mandawa, Tanganyika ; Callovian.

REMARKS. This specimen, which is 36 mm. long, is in every way typical of *T. viceliacensis*, a species characterized by its prominent, obtusely angular, submedian umbones and not very elongated form. The species was originally described from the Bathonian of France and has been recorded from beds attributed to that stage in Algeria and Sinai as well as in Europe. In British Somaliland, however, it has been found in beds regarded as Callovian. A specimen from beds of doubtful but possibly post-Callovian age at Dakatch, Italian Somaliland, attributed by Weir (1929 : 34, pl. 3, fig. 19) to *T. viceliacensis* is not so tall and trigonal as typical specimens of the species and may belong to a distinct form.

Superfamily **POROMYACEA**

Family **CUSPIDARIIDAE** Dall 1886

Genus ***CUSPIDARIA*** Nardo 1840

Cuspidaria ayersi sp. nov.

Pl. 21, figs. 6*a*, *b*, 7*a*, *b*

SPECIFIC NAME. After Mr. F. M. Ayers, of the Geological Survey of Kenya.

DIAGNOSIS. Shell of small-medium size (length of holotype 10·3 mm.), slightly longer than high, subalate posteriorly. Left (and only known) valve strongly inflated, with very prominent and narrowly rounded umbo situated just anterior to mid-length and strongly incurved to the prosogyrous beak. Anterior margin strongly convex, curved in continuity with ventral margin, the anterior part of which has a shallow sinus in some specimens. Posterior wing of feeble convexity, rounded at its tip, which is level with or extends to a variable extent beyond the posterior extremity of the ventral margin ; wing separated from inflated body of valve by radial sulcus to which there corresponds a sinus of posterior margin. Ornament consisting of regularly arranged concentric ribs absent from posterior wing in some specimens.

HOLOTYPE AND PARATYPES. Holotype, no. LL.13246. About 15 paratypes.

LOCALITY AND HORIZON. 1 mile N. of Asaharbito, N.E. Kenya ; Bathonian [? or Callovian], Asaharbito Beds.

REMARKS. In this species the ventral margin extends further in a posterior direction than in the European Kimmeridgian species *Cuspidaria fontannesii* (de

Loriol) (1878 : 141, pl. 22, figs. 2, 3) or in the two Tithonian species *C. picteti* (Zittel) (1870 : 118, pl. 12, fig. 7) and *C. transylvanica* (Neumayr) (1873 : 205, pl. 43, fig. 5) ; in consequence, the posterior margin has a well-defined sinus. These are the two most closely comparable species described previously.

Class **GASTROPODA** Cuvier

Subclass *PROSOBRANCHIA* Milne Edwards

Superfamily **EUOMPHALACEA**

Family **EUOMPHALIDAE** de Koninck 1881

Genus ***DISCOHELIX*** Dunker 1848

Discohelix didimtuensis sp. nov.

Pl. 22, figs. 1*a*, *b*, *c*, *d*

Diagnosis. Rather small (diameter of largest specimen 10·5 mm.), discoidal, compressed, upper face flat, lower face umbilicate. Outer face low, slightly concave, inclined inwards to a slight extent in an abapical direction, and separated from upper face and from base by tuberculate carinae which project in an abaxial direction. Some tubercles of both carinae are elongated transversely, so that on both the upper face and the base they remain partly visible along the outer suture on the earlier whorls, and in some specimens they are continued across the upper face of these whorls by weak transverse riblets. The entire surface of the shell is ornamented with delicate spiral threads.

Holotype and paratypes. Nos. GG.10246 and GG.10247–49 respectively, four specimens in all.

Locality and horizon. Didimtu hill, two miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

Remarks. In *Discohelix dunkeri* Moore (1867 : 85, pl. 5, figs. 28, 29 ; also Dumortier 1874 : 141, pl. 35, figs. 18, 19), from the Upper Lias of southern England and France, the ornament of the shell is closely comparable to that of the new species, but the two carinae are less prominent and, between them, the outer face of the shell is feebly convex ; transverse riblets originating at the tubercles are well marked on both the upper face and the base. *D. sinistra* (d'Orbigny) (1853 : 310, pl. 322, figs. 1–7), from the Middle Lias of France, differs in much the same manner. *D. albinatiensis* Dumortier (1874 : 284, pl. 59, figs. 3–5 ; also Kuhn 1935 : 132, pl. 10, fig. 5), from the Upper Lias of France and Germany, much resembles the new species, but the lower of its two carinae projects abapically instead of outward, and the outer face of the shell is convex rather than concave.

Genus *NUMMOCALCAR* Cossmann 1896

Nummocalcar mitoleensis sp. nov.

Pl. 22. figs. *2a, b, c*

Diagnosis. Of medium size (diameter 24 mm.), discoidal, with a barely protruding spire, the apex of which is just visible when the shell is viewed from the side, and with the periphery formed by a smooth, projecting carina at about mid-height. Outer face, above the carina, flat and inclined inwards steeply as far as an angulation which bears well separated, rounded nodes and forms the border of the flat upper face. Base, consisting of all the surface below the carina, slightly concave in profile owing to the presence of a broad swelling, bearing weak, transversely elongated tubercles, on the outer side of a smooth spiral cord which forms the margin of the moderately broad umbilicus. Where not eroded, the base bears weak spiral cords, but any spiral ornament that may have been present above the peripheral carina has been obliterated by erosion. Aperture broader than high, but with its margin not preserved intact ; growth-lines visible below the peripheral carina show that the outer lip was strongly prosocline, and had a very broad sinus.

Holotype. No. GG.10282, *ex* B.P. Coll. The only specimen.

Locality and horizon. Mpilepile stream bed, 1650 yards N.E. of Mitole road junction, northern Mandawa area, Tanganyika ; Upper Kimmeridgian.

Remarks. This species belongs to a group of Jurassic and Cretaceous forms characterized by a carinate periphery and by tuberculate ornament on both the upper face of the whorls and the base, the tubercles being elongated transversely in some species to form ribs. The Albian species " *Solarium* " *subornatum* d'Orbigny (*S. ornatum* J. de. C Sowerby, *non* Lea) is a characteristic representative of this group and is clearly congeneric with the form now described. Until a revision of all Mesozoic discoidal and subdiscoidal shells can be carried out, Cossmann is followed in referring the species of this group to *Nummocalcar*. In the type species of this genus, however, strong transverse ribs on the upper face of the whorls end in prominent spines on the peripheral carina. It is uncertain if this genus should be included in the Euomphalidae, where it was placed by Cossmann, or if it should be assigned to the Architectonicidae or possibly to a new family.

Superfamily **PLEUROTOMARIACEA**

Family **PLEUROTOMARIIDAE** Swainson 1840

Genus *BATHROTOMARIA* Cox 1956

Bathrotomaria aitkeni sp. nov.

Pl. 22, fig. 6 ; Pl. 23, figs. *1a, b*

Specific name. After Dr. W. G. Aitken, lately Director of the Geological Survey of Nyasaland, collector of the type specimens.

Diagnosis. Large (original height of largest specimen 110 mm.), trochiform, with diameter approximately equal to or slightly less than height and with narrow, deep umbilicus. Whorls with slightly concave outer face, which is steeply and somewhat variably inclined, and a broad ramp, varying from feebly concave to feebly convex, which forms an angle averaging about 45° with shell axis. Whorl shoulder formed by rounded spiral cord bearing selenizone. Base feebly convex, its periphery formed by second rounded cord which is almost of the same strength as the first and is just exposed in places on the spire whorls. Ornament of ramp, whorl outer face and base consisting of numerous spiral cords and threads of unequal strength. (Collabral threads, if originally present, have been obliterated by erosion in the specimens examined.)

Holotype and paratypes. Nos. GG.10306 and GG.10307–08 respectively, three specimens in all.

Localities and horizon. At three points along the Mandawa–Namakongoro stream, Mandawa–Mahokondo area, Tanganyika ; Middle-Upper Kimmeridgian.

Remarks. Its large size distinguishes this species from any Jurassic *Bathrotomaria* described previously. The English Upper Oxfordian and Kimmeridgian species *B. reticulata* (J. Sowerby) (1821*a* : 128, pl. 272, fig. 2), which attains a diameter of 90 mm., has not such a distinct carina at the periphery of its base and its spiral ornament is rather more delicate. *B. solodurina* (Thurmann & Étallon) (1861 : 129, pl. 11, fig. 102), based on an internal mould 65 mm. in diameter from the Kimmeridgian of the Swiss Jura, could possibly be a synonym of *B. reticulata*. *B. neosolodurina* (Dacqué) (1905 : 141, pl. 16, figs. 5, 6), from the Kimmeridgian of Somaliland, is more depressed than the new species now described.

Superfamily **PATELLACEA**

Family uncertain

Genus ***PSEUDORHYTIDOPILUS*** Cox 1960 (*ex* Haber, *nom. nud.*)

Pseudorhytidopilus lonjiensis sp. nov.

Pl. 22, figs. 3*a*, *b*

Diagnosis. Outline broadly elliptical, rather flattened anteriorly and posteriorly ; moderately large (length of holotype c. 33 mm., breadth c. 28 mm.), well elevated (height of holotype c. 16 mm.), with apex situated at about anterior quarter of length and directed anteriorly. Ornament consisting of conspicuous concentric growth-undulations, about 1 mm. apart.

Holotype. No. GG.10312. The only specimen.

Locality and horizon. Along Lonji–Runjo stream at a point 1½ miles W. of Mandawa, Tanganyika ; Callovian.

Remarks. The genus *Rhytidopilus* (type-species *Patella humbertina* Buvignier) was founded by Cossmann (1895 : 143) for the reception of certain rather irregularly conical internal moulds of shells of Mesozoic age with strong growth undulations and a narrow, elevated sector, bordered by furrows, running from the apex to the anterior margin. *Pseudorhytidopilus* includes patelliform shells which are similar to *Rhytidopilus* except that the raised anterior sector is absent. The species most closely comparable to the one now described is *Pseudorhytidopilus arsinoe* (d'Orbigny) (figured by Thevenin 1913*a*, pl. 36, figs. 1, 2), from the Callovian of France, but in that species the apex is more elevated and placed in a less anterior position. Its anteriorly pointing and much more forward-placed apex distinguishes the new species from the three European Kimmeridgian species *P. banneana* (Rollier) (1918 : 11, for *Patella humbertina* Thurmann & Étallon 1861, pl. 13, fig. 131, *non* Buvignier), *P. castellana* (Thurmann & Étallon) (1861, pl. 13, fig. 132), and *P. lennieri* Cox (1960 : 237, for *Helcion castellana* Lennier 1872, pl. 8 B, figs. 8, 8*a*).

Family **SYMMETROCAPULIDAE** Wenz 1938

Genus ***SYMMETROCAPULUS*** Dacqué 1933

Symmetrocapulus ? sp.

Pl. 22, figs. 5*a*, *b*

1914. ?*Patella* (*Fissurella* ?) sp. ; Dietrich : 116, pl. 11, fig. 4.

Material. One specimen (no. G.48031).

Locality and horizon. Tingutitinguti creek, Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

Remarks. The specimen now recorded is a small, radially ribbed, patelliform shell nearly 9 mm. long. Like the specimens described by Dietrich, as cited above, it has lost its apex, so that its generic affinities are uncertain. The apex was evidently situated within the anterior third of the length of the shell, the dorsal profile rising slightly above it posteriorly before curving down to the posterior margin. The numerous radial riblets are unequal in breadth and rather irregularly distributed ; their intervals are, on the average, of about the same width as the riblets. The whole surface, where uneroded, can also be seen to bear fine concentric threads. Dietrich's figure appears to represent a specimen with broader and fewer ribs than the present one, but the species may be the same. Haber (1932 : 249) suggested the reference of Dietrich's form to *Symmetrocapulus* (then a *nomen nudum*), but the part of his catalogue in which it would have been listed systematically and possibly given a specific name was never published.

Family **ACMAEIDAE** Carpenter 1857

Genus ***SCURRIOPSIS*** Gemmellaro 1879

Subgenus ***DIETRICHIELLA*** Wenz 1938

Scurriopsis (Dietrichiella) kindopensis (Dietrich)

Pl. 22, figs. 4*a*, *b*

1914. *Patella kindopensis* Dietrich : 116, pl. 11, fig. 3.
1932. *Scurria (Dietrichiella)*[3] *kindopensis* (Dietrich) ; Haber : 220.
1938. *Scurria (Dietrichiella) kindopensis* (Dietrich) ; Wenz : 219, fig. 405.

MATERIAL. One specimen (no. G.48913).

LOCALITY AND HORIZON. Kindope valley, N.W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

REMARKS. This small patelliform gastropod, which is 11·3 mm. long and 7·2 mm. broad, is a little larger than Dietrich's holotype, but agrees with it in shape and ornament. The latter consists of concentric rugae and of scarcely perceptible radial grooves confined to the neighbourhood of the posterior margin. The apex is placed at about one-sixth of the length of the shell from its anterior end, the longitudinal profile from it to the posterior end forming an evenly convex curve.

Superfamily **TROCHACEA**

Family **TROCHIDAE** Rafinesque 1815

Subfamily **PROCONULINAE** Cox 1960

Genus ***AFRICOCONULUS*** nov.

DIAGNOSIS. Shell slightly coeloconoid, well elevated, anomphalous ; last whorl with two tuberculate or spinose carinae at periphery, the upper and stronger carina forming prominent angulation, the lower one just visible at suture on spire whorls; remainder of surface ornamented with simple or beaded spiral cords and raised collabral threads ; base low, rather flattened ; columellar lip short, simple, describing a broad curve abapically to merge with basal lip.

TYPE SPECIES. *Proconulus spinatus* Dubar (1948 : 126, pl. 10, figs. 7–9), Middle Lias, Morocco.

REMARKS. In this genus the ornament is rather like that of *Eucyclus*, but the depressed base and the shape of the aperture indicate that there is no real affinity with that subgenus. Dubar was undoubtedly correct in detecting some affinity between his species, taken as its type, and *Proconulus*, but in typical species of that genus the whorls lack prominent peripheral carinae and have only weak spiral ornament. There is much resemblance between the new genus and *Metaconulus* Cossmann, of the Lower Tertiary, but it is to be assumed that this was due to convergence. In the Triassic genus *Diplochilus* Woehrmann, which also has two peripheral carinae, the aspect of the ornament of the shell is quite different. In *Dimorphotectus* Cossmann, also founded on a Triassic species, the very short columellar lip has a prominent median fold.

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[3] As published by Haber, this subgeneric name was a *nomen nudum*.

Africoconulus kenyanus sp. nov.

Pl. 30, figs. 9*a*, *b*, *c*

DIAGNOSIS. Rather small (height of largest specimen 14 mm.), trochiform, with well elevated, slightly coeloconoid spire ; diameter four-fifths of height ; aperture occupying about two-fifths of total height. Spire whorls with a prominent carina situated at lower third of their height and bearing prickly tubercles; above the carina are two spiral rows of smaller tubercles coinciding with angulations of the surface, the upper angulation bordering a narrow sutural ledge. Margin of base formed by a second carina which continues the line of the suture ; this carina is slightly less prominent than the one above it and bears smaller and more numerous tubercles than those on the upper one. The base, which is very little extended, is flattened-convex adaxially and is slightly excavated but not umbilicate mesially ; it bears a few unevenly distributed spiral cords. In addition, the whole surface of the shell bears raised collabral threads which are well separated in some specimens ; threads slightly prosocline above main carina and more strongly so below it, while on the base some become strengthened adaxially to form transverse riblets. Apertural margin imperfect in all specimens.

HOLOTYPE AND PARATYPES. Nos. GG.10250 and GG.10251–57 respectively, eight specimens in all.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. This species is clearly congeneric with *Africoconulus spinatus* (Dubar), type species of the new genus, but is much smaller and its upper carina has not the prominent spines which are present in that species.

Subfamily **ANGARIINAE** Thiele 1924

Genus ***CHRYSOSTOMA*** Swainson 1840

Chrysostoma staffi Dietrich

Pl. 24, figs. 1*a–c*

1914. *Chrysostoma Staffi* Dietrich : 122, pl. 11, fig. 6.

MATERIAL. One specimen (no. G.48567).

LOCALITY AND HORIZON. " Ditch 2x ", Tendaguru, Tanganyika ; just above top of lower " *Trigonia smeei* " Bed, i.e. Upper Kimmeridgian (cf. Parkinson 1930, fig. 3, showing horizons near Tendaguru hill).

REMARKS. The specimen now recorded, which is 17 mm. in diameter and 14 mm. high, agrees so well with Dietrich's figure that there seems no doubt about its specific identity. The spire of the shell is very obtuse, with slightly concave sides, and the sutures are scarcely impressed. The last whorl is broadly rounded at the periphery and the base is convex, quite uncoated with callus, and narrowly umbilicate. The outer lip is broken away, but the growth-lines are strongly prosocline. The aperture, which occupied about five-sixths of the total height of the shell, was evidently almost circular. The shell wall is thick and the surface quite smooth.

This specimen appeared at first sight to belong to the genus *Ataphrus*, from which it differs, however, in its open umbilicus. Dietrich, when describing *C. staffi*, commented on its striking similarity to *Ataphrus laevigatus* (J. Sowerby) (cf. Hudleston 1894 : 349, pl. 29, figs. 5, 6), of the Inferior Oolite. The holotype was said to come from Neocomian beds at a locality near Mikadi, Tanganyika, but the specimen now recorded appears to be from an Upper Jurassic horizon.

Family **ATAPHRIDAE** Cossmann 1918

Genus ***ATAPHRUS*** Gabb 1869

Ataphrus aff. ***acmon*** (d' Orbigny)

Pl. 24, figs. 2*a*, *b*

1850*a*. Aff. *Trochus Acmon* d'Orbigny : 265.
1853. Aff. *Trochus Acmon* d'Orbigny : 278, pl. 314, figs. 1–4.
1885. Aff. *Ataphrus Acmon* d'Orb. ; Cossmann : 281, pl. 7, figs. 9, 10.
1894. Aff. *Ataphrus Acmon* d'Orbigny ; Hudleston : 351, pl. 29, fig. 11.

MATERIAL. One specimen (no. G.26204).

LOCALITY AND HORIZON. Kidugallo, Central Railway, Tanganyika ; Bajocian, Station Beds.

REMARKS. This specimen, which is about 9 mm. high, agrees very well with the figures of the European Bajocian species *A. acmon* cited above. Its last whorl and aperture, however, are imperfect, so that it seems advisable to qualify its specific determination.

Genus ***TROCHOPSIDEA*** Wenz 1938

Trochopsidea africana sp. nov.

Pl. 24, figs. 5*a*, *b*, *c*, *d*

DIAGNOSIS. Shell small (diameter of largest specimen c. 7 mm.), turbiniform, diameter exceeding height ; spire obtusely cyrtoconoid, its height almost equal to that of the aperture. Whorls smooth, of moderate and even convexity, the last one broadly rounded at the periphery. Base evenly convex ; no umbilicus. Inner lip with moderately wide, grooved outer face, which is limited by a carina and is devoid of a tubercle.

Holotype and paratypes. Nos. GG.10258 and GG.10259–62 respectively, five specimens in all.

Locality and horizon. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

Remarks. The characters of the inner lip of this species agree with those of *Trochopsidea*, the presence of the groove on the outer face of this lip distinguishing the species from representatives of *Ataphrus*, which it resembles in its general morphology. *Turbo garnieri* Dumortier (1874 : 139, pl. 35, figs. 15–17), from the Upper Lias of southern France, which much resembles the present species except that it is slightly more elevated, has not a grooved inner lip and appears to belong to *Ataphrus* (*Endianaulax*). A specimen from the Upper Lias of Germany identified by Kuhn (1935 : 136, pl. 8, fig. 21) as *Ataphrus* cf. *lucidus* (Thorent) (a species included by Cossmann in the subgenus *Endianaulax*) is more depressed than the present form.

Superfamily **NERITACEA**

Family **NERITIDAE** Rafinesque 1815

Genus ***NERITOMA*** Morris 1849

Subgenus ***NERIDOMUS*** Morris & Lycett 1851

Neritoma **(*Neridomus*)** aff. ***gea*** (d'Orbigny)

Pl. 24, figs. 7*a*, *b*

1852. Aff. *Nerita Gea* d'Orbigny : 232, pl. 302, figs. 5–7.
1885. Aff. *Nerita Gea* d'Orb. ; Cossmann : 155, pl. 3, figs. 1, 2.
1908. Aff. *Nerita gea* d'Orbigny ; H. Fischer : 268, pl. 11, figs. 5–12.

Material. Three specimens (nos. G.61310–12).

Locality and horizon. S. of Tarawanda, 26 miles W.S.W. of Bagamoyo, Tanganyika ; Callovian.

Remarks. The specimens now recorded, the best of which is just under 10 mm. in height and diameter, are characterized by their low spire, obtusely rounded apex, and flush sutures. The apex and axis are rather strongly eccentric. The specimens belong to a group of species which is well represented in the Bathonian of Europe and has been discussed by H. Fischer (1908). They seem to be very closely comparable to *Neritoma* (*Neridomus*) *gea*, but they are a little larger than the specimens figured by the authors cited above, and their axis is more eccentric. They are also rather similar in shape to *N.* (*N.*) *louisiae* Fischer (1953 : 15, pl. 1, figs. 21–27), also from the French Bathonian, but that species attains a much larger size (20 mm.) and has a more pointed apex. Cossmann (1926 : 305, pl. 5, figs. 1*a*–*c*) has recorded a specimen of the same group from the Callovian of Sinai under the name *Neridomus punctatus* (Piette), but it is also considerably larger than the specimens now recorded. The species *Neritodomus sukidugallensis* Reck (1921 : 435, text-fig. 3) was founded on a small broken shell from the Bajocian of a locality along the Central Railway, Tanganyika, and appears to have a more prominent apex than the form now recorded. The shell from the Saurian Beds of Tendaguru recorded by Dietrich (1914 : 126, pl. 11, figs. 10*a*, *b*) as *Nerita* cf. *transversa* v. Seebach var. *minor* de Loriol differs from the specimens now recorded in much the same manner as does *N. louisiae*.

Genus ***LISSOCHILUS*** Zittel 1882

Lissochilus stremmei Dietrich

Pl. 24, figs. 4*a*, *b*

1914. *Nerita* (*Lissochilus*) *Stremmei* Dietrich : 126, pl. 11, figs. 11*a–e*.

MATERIAL. Three specimens (nos. G.48903, G.48912, GG.10315).

LOCALITIES AND HORIZONS. Kipande, W. of Tendaguru, Tanganyika ; Upper Kimmeridgian, *Nerinea* Beds. Kindope valley, N.W. of Tendaguru ; Upper Kimmeridgian, " *Trigonia smeei* " Beds. 1½ miles N.W. of Mandawa, Tanganyika ; Upper Kimmeridgian.

REMARKS. In this species a strong rounded carina forms the periphery of the shell and a strong, rounded-off angulation marks the boundary of a subhorizontal sutural shelf. Below the periphery are several spiral cords, one of which may stand out as a keel. Rather irregularly distributed collabral ridges are most conspicuous on the later formed part of the last whorl and give rise to tubercles on some of the spirals. The two largest specimens now recorded, which are rather eroded, are about 23 mm. in diameter.

Superfamily **PALAEOTROCHACEA**

Family **PARATURBINIDAE** Cossmann 1916

Genus ***CHARTRONELLA*** Cossmann 1902

Chartronella mitoleensis sp. nov.

Pl. 24, figs. 3*a*, *b*

DIAGNOSIS. Shell of medium size, trochiform, with height (19 mm. in the holotype) very slightly exceeding diameter. Whorls bicarinate, the upper carina forming the edge of a subhorizontal, slightly concave sutural ledge, the lower, which projects abaxially slightly more than the upper one, just exposed above the suture on the later whorls and forming the periphery of the base of the shell. Outer face of whorls, between the carinae, concave. Base convex, umbilicus absent. Narrow spiral cords, with transverse threads crossing their intervals, are present near the carinae, but spiral ornament is absent from the remainder of the shell (it could conceivably, however, have been removed by erosion in the holotype). Aperture almost circular (the outer lip is broken in the holotype) ; a spiral swelling originating at the lower margin of the aperture forms the lower border of the convex part of the base.

Holotype. No. GG.10313 ; there is no other material except an associated internal mould, which scarcely ranks as a paratype.

Locality and horizon. Mpilipili stream at a point about 1 mile N.E. of Mitole, Tanganyika ; Upper Kimmeridgian.

Remarks. This form resembles the type-species of *Chartronella, C. digoniata* (Cossmann) (1902 : 199, pl. 4, figs. 24–26), from the Hettangian of France, in its bicarinate but otherwise almost smooth whorls, in its convex base, and in the absence of an umbilicus, but it differs in the fact that the upper of its two carinae marks the edge of a subhorizontal ledge instead of a steeply sloping sutural ramp, so that its whorls are much lower than in Cossmann's species.

Family **CIRRIDAE** Cossmann 1916

Genus ***CIRRUS*** J. Sowerby 1815

Cirrus mazerasensis sp. nov.

Pl. 24, figs. 8*a*, *b*

Diagnosis. Of medium size (original height of holotype, allowing for missing last whorl, c. 25 mm. ; height of spire as preserved, c. 15 mm.), sinistral. Spire coeloconoid with a very acute apex, and consisting of whorls which are at first almost flat but become increasingly convex during growth. Ornament consisting of variably but mostly strongly prosocline transverse riblets and of strong concentric threads which override them and occupy their intervals ; the ribs, which appear close to the upper suture but die out before reaching the lower one, are separated by intervals which are almost equal to them in width on the earlier whorls but become almost twice as wide on the last preserved whorl ; the spirals number 6 on the later whorls and are separated by intervals about twice as wide. Last whorl and aperture unknown.

Holotype. No. GG.6524, an external mould of the spire of the shell from which squeezes have been prepared.

Locality and horizon. Ribe, 9 miles N.E. of Mazeras, Kenya ; Bajocian (?), Mazeras Sandstones.

Remarks. The strongly coeloconoid spire suggests that the last whorl (no longer preserved) was umbilicate, so that the species is a *Cirrus* rather than a *Hamusina*. No species with identical ornament can be traced in the literature.

Genus ***HAMUSINA*** Gemmellaro 1878

Hamusina thompsoni sp. nov.

Pl. 24, figs. 9*a*, *b*

Specific name. After Mr. A. O. Thompson, of the Geological Survey of Kenya.

Diagnosis. Shell small for the genus (height 11 mm.), acute, sinistral, with aperture occupying about one-third of total height ; spire angle c. 30°. Periphery of whorls, situated at about the lower third of their height, formed by an obtuse angulation bearing large rounded tubercles, above which the whorl outline is feebly concave. Spire whorls ornamented, in addition, with a row of small tubercles bordering the upper suture and with very weak spiral threads which are present on their entire surface except where removed by erosion. Margin of base formed by a narrow, smooth cord continuing the line of the suture ; base ornamented with spiral riblets. Aperture circular (its margin is imperfect).

HOLOTYPE. No. GG.10263. The only specimen.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. This small shell is unquestionably congeneric with *Turbo bertheloti* d'Orbigny, the type species of *Hamusina*, but it differs from that species in obvious details of ornament. No species very closely comparable to it is described in the literature.

Superfamily **SUBULITACEA**

Family **PSEUDOMELANIIDAE** Fischer 1885

Genus ***PSEUDOMELANIA*** Pictet & Campiche 1862

Pseudomelania aspasia (d'Orbigny)

Pl. 24, fig. 10

1850*a*. *Chemnitzia Aspasia* d'Orbigny : 298.
1851. *Chemnitzia Aspasia* d'Orb. ; d'Orbigny : 49, pl. 242, fig. 4.
1851. *Chemnitzia niortensis* d'Orbigny : 48, pl. 242, figs. 1, 2.
1885. *Pseudomelania niortensis* (d'Orb.) ; Cossmann : 172, pl. 9, figs. 6, 7.

MATERIAL. One shell (no. GG.10317). Two incomplete internal moulds may also belong to the species.

LOCALITIES AND HORIZONS. Shell-bearing specimen from Nchia stream, 2 miles W.N.W. of Mandera, Tanganyika ; internal moulds from Lonji stream, E.N.E. of Nandenga, Tanganyika ; Callovian.

REMARKS. The shell-bearing specimen agrees so closely with the figures of *P. aspasia* published by d'Orbigny and by Cossmann that I see no reason to qualify its specific determination. The species occurs typically in the Bathonian of France. In *P. caecilia* (d'Orbigny) (1851 : 64, pl. 248, fig. 2 ; de Loriol 1874 : 331, pl. 8, figs. 1*a*, *b*), from the Lower Kimmeridgian of France, and *P. laufonensis* Thurmann & Étallon (1861 : 88, pl. 6, fig. 27), a Swiss species of about the same age, the spire angle is about the same but the whorls are quite flat.

On the internal moulds now recorded there is a tendency for a spiral groove to be developed low on the side of the whorl, just above the lower suture. As it is discontinuous it does not appear to represent a spiral fold on the interior of the whorls and it may have arisen by deformation of the internal mould after the shell had disappeared in solution.

Pseudomelania dusseensis sp. nov.

Pl. 24, figs. 11*a*, *b*, *c*

Diagnosis. Shell small (height about 11 mm.), regularly conical, moderately acute (spire angle about 16°), with the spire formed of rather low, very feebly convex (virtually flat) whorls, separated by flush sutures ; height of spire whorls equal to about one-half of their diameter. Last whorl abruptly rounded, almost angular at periphery ; base low, feebly convex, without umbilicus. Aperture broader than high ; outer lip flat or very feebly convex ; columellar lip short. Surface smooth ; growth-lines, where faintly visible, arched, with a shallow forward-facing concavity.

Holotype and paratypes. Nos. G.76399 and G.76400–02 respectively, four specimens in all.

Locality and horizon. Low hills at Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones.

Remarks. This species closely resembles *Pseudomelania communis* (Morris & Lycett) (1851 : 48, pl. 9, figs. 21, 21*a*), from the English Bathonian, but is distinguished by its flatter whorls. *P. laubei* Cossmann (1885 : 176, pl. 11, figs. 32, 33 ; pl. 15, fig. 47), from the Bathonian of France, is a larger shell (25 mm. high), with slightly higher whorls. In the French Callovian species *P. calloviensis* (Hébert & Deslongchamps) (Couffon 1919 : 126, pl. 8, figs. 19–19*e* ; Cossmann 1924 : 4, pl. 1, figs. 21–23) the whorls are relatively higher. *P. calloviensis* has axial riblets on its earliest formed whorls and therefore belongs to the subgenus *Hudlestoniella* Cossmann. As the corresponding whorls are missing on the specimens now described it is not possible to say if the species should be included in that subgenus rather than in *Pseudomelania* s. str. Of European Oxfordian species, *P. ebersteini* (Thurmann) (de Loriol 1899 : 133, pl. 9, fig. 20), from the Swiss Jura, is a broader shell than the form now described and has more strongly convex whorls.

Pseudomelania vittata (Phillips)

Pl. 24, fig. 12

1829. *Melania vittata* Phillips : 145, pl. 7, fig. 15.
1863. *Chemnitzia vittata* (Phil.) ; Lycett : 14, pl. 31, fig. 10.
1882. *Chemnitzia vittata* (Phil.) ; Hudleston : 244, pl. 6, figs. 5*a*, *b*, 6.
1905. *Pseudomelania vittata* (Phil.) ; Blake : 77, pl. 8, figs. 1, 2.
1950. *Pseudomelania vittata* (Phillips) ; Cox & Arkell : 62.

Material. One specimen (no. GG.10316).

Locality and horizon. 1 mile N. of Manyuli, Tanganyika ; Upper Kimmeridgian.

Remarks. *Pseudomelania vittata* is a large form characterized by the presence on the last whorl of two strong but obtuse keels, between which the face of the shell is slightly concave. On the spire whorls the upper keel lies at about the posterior third of the height, while the lower keel may or may not be visible near the lower suture, according to the degree of whorl overlap. I am unable to distinguish the

East African specimen from those from England, where, however, the species seems to be confined to the Cornbrash (Upper Bathonian-Callovian). The original length of this specimen was about 120 mm., but it now lacks the apical whorls.

In the well-known species *P. heddingtonensis* (J. Sowerby), of the Upper Oxfordian and Lower Kimmeridgian of Europe, the size and proportions of the shell are much the same as in the specimen now recorded, and in some specimens there is a slight spiral swelling of the whorl face in the same position as the upper carina of *P. vittata*. The outer face of the whorl is, however, convex and there is no carina at the periphery of the base. Hudleston (1882 : 245) commented on the doubtful value of the specific distinctions drawn between a number of Jurassic " Chemnitzias ", but thought that the slight differences noted might depend upon the geological horizon. It is evident from the occurrence now recorded that the differences between *P. vittata* and *P. heddingtonensis* have no stratigraphical significance.

Of other Upper Jurassic species of the group now described, *P. sulcata* (Zieten) (Brösamlen 1909 : 283, pl. 21, fig. 15), from the Kimmeridgian of Nattheim, southern Germany, and a series of forms from France (*P. athleta, P. pollux, P. columna, P. domoisii*, etc.) illustrated by d'Orbigny (1851, pls. 245–248), all, like *P. heddingtonensis*, differ from *P. vittata* in lacking the lower of the two carinae on the last whorl.

Subgenus *OONIA* Gemmellaro 1878

Pseudomelania (Oonia) kidugalloensis sp. nov.

Pl. 26, figs. 4*a*, *b*, *c*

Diagnosis. Shell of medium size for the genus (height of holotype 10·4 mm.), phasianelliform, height of aperture about three-sevenths of that of shell ; spire angle about 40°. Protoconch unknown complete. Spire whorls strongly convex, about twice as broad as high, abutting simply at the sutures ; last whorl evenly convex at periphery. Base also evenly convex in outline, not much extended, without umbilicus. Aperture obliquely oval, its height nearly twice its breadth. Columellar lip short, apparently joining basal margin of aperture in an even curve. Outer lip almost orthocline ; details of parietal region not well seen. Growth-lines obscure.

Holotype. No. GG.10280. The only specimen.

Locality and horizon. 2½ miles N.N.W. of Kidugallo, Tanganyika ; Bajocian.

Remarks. This species seems closely comparable to the English Bajocian species " *Phasianella* " *latiuscula* Morris & Lycett, as figured by Hudleston (1891 : 251, pl. 19, figs. 10*a*, *b*), but its spire occupies a relatively greater proportion of the height of the shell than in that species and it is much smaller. The English species is included in *Pseudomelania* (*Oonia*) by Cox & Arkell (1950 : 97).

Pseudomelania* (*Oonia*) *conica (Morris & Lycett)

Pl. 25, figs. 2*a*, *b*, *c*

1851. *Phasianella conica* Morris & Lycett : 74, pl. 11, figs. 30, 30*a*.
1851. *Phasianella acutiuscula* Morris & Lycett : 75, pl. 9, fig. 2 ; pl. 11, figs. 28, 28*a* (*non* Lycett 1850).
1885. *Phasianella acutiuscula* Morris & Lycett : Cossmann : 253, pl. 9, fig. 18 ; pl. 17, figs. 22, 23.
1900. *Phasianella ? acutiuscula* Morris & Lycett ; Cossmann : 571, pl. 17, fig. 19.
1907*b*. *Phasianella ? acutiuscula* Morris & Lycett ; Cossmann : 253, pl. 7, fig. 5.

MATERIAL. One specimen (no. GG.10463).

LOCALITY AND HORIZON. 2 miles W. of Tengeni (village on Pangani river), in Mbuzi Mkubwa stream, Tanganyika ; Bathonian (?).

REMARKS. The specimen, which is 21·5 mm. high, agrees well with some specimens from the Great Oolite of England, although it is slightly more slender than those figured by Morris and Lycett. The sutures are flush and the spire is slightly cyrtoconoid. Another Bathonian species, *P.* (*O.*) *variata* (Lycett 1863 : 104, pl. 45, figs. 28, 28*a*, *b*), especially as figured by Cossmann (1885 : 255, pl. 4, fig. 52 : pl. 11, fig. 17), is also of much the same proportions as the shell now recorded, but its sutures are more impressed and its base is less extended.

Pseudomelania* (*Oonia*) *dietrichi sp. nov.

Pl. 24, figs. 6*a*, *b*

1914. *Pseudomelania* (*Oonia*) aff. *Sancti Antonii* (Struckmann) ; Dietrich : 129, pl. 11, figs. 17*a–c*.

DIAGNOSIS. Shell of medium size (height of holotype 34 mm.), of moderate acuteness (spire angle about 30°) ; aperture occupying about three-sevenths of total height. Whorls strongly and evenly convex, their mean height equal to about one-half of their diameter. Ornament consisting of faint spiral striae together with growth rugae which are strongly pronounced on the last whorl and are slightly arched, with a backward-facing convexity.

HOLOTYPE AND PARATYPES. Nos. G.48028 and G.48021–27 respectively, eight specimens in all.

LOCALITY AND HORIZON. Tingutitinguti creek, Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed.

REMARKS. A search through the literature has confirmed Dietrich's conclusion that the most closely comparable species previously described is *Chemnitzia Sancti Antonii* Struckmann (1878 : 110, pl. 7, figs. 2*a*, *b*, 3), from the Kimmeridgian of Ahlem, near Hanover. In the species in question, however, the shell is slightly more acute than in the Tendaguru shell and a fine reticulate ornament is present, in which the spiral threads are slightly more prominent than the collabral ones, whereas in the East African form the spiral lines are scarcely visible to the unaided eye and much weaker than the collabral rugae. Another comparable European species is *P. collisa* de Loriol (1874 : 334, pl. 7, figs. 30, 31), from the Lower Kimmeridgian of France, but its whorls are slightly more convex than those of the form now described.

Pseudomelania* (*Oonia*) *aitkeni sp. nov.

Pl. 25, figs. 1*a*, *b*, *c*

Specific name. After Dr. W. G. Aitken, lately Director of the Geological Survey of Nyasaland, and collector of the holotype.

Diagnosis. Shell of medium size (height of holotype c. 22 mm.), ovate-conical, with diameter equal to about one-half of height. Spire slightly coeloconoid, with very acute apex. Spire whorls low, their mean height rather less than one-third of their diameter, feebly convex, the later ones with a narrow, ill-defined sutural ledge. Last whorl broadly and evenly convex at periphery, outline of base scarcely excavated ; no umbilicus. Aperture oval, originally occupying about one-half of total height of shell (its margin, however, is broken away in the holotype). Surface smooth.

Holotype. No. GG.10318. The only specimen.

Locality and horizon. Along Mandawa–Namakongoro stream, about 1 mile W. of Mandawa, Tanganyika ; Middle-Upper Kimmeridgian.

Remarks. As the apertural margin is broken away in the holotype it is not possible to observe if (as in the Pseudomelaniidae) it was uninterrupted anteriorly or if (as in some Coelostylinidae) a small notch or sinus was present at the foot of the columella. The species is here referred to the pseudomelaniid subgenus *Oonia*, from the typical species of which it differs in its aciculate apex. It is of about the same size and proportions as *Pseudomelania* (*Oonia*) *recki* Dietrich (1914 : 130, pl. 11, figs. 16*a*, *b*), from Tendaguru, but is readily distinguished by its coeloconoid spire and more numerous and flatter whorls. In *P.* (*O.*) *cornelia* (d'Orbigny) (1851 : 60, pl. 245, figs. 2, 3), from the " Corallian " of the Ardennes, and in *P.* (*O.*) *quirandi* de Loriol (1887 : 145, pl. 15, figs. 5, 6), from the Lower Kimmeridgian of Valfin (Jura), the spire is slightly cyrtoconoid and the last whorl is less inflated. *P.* (*O.*) *daphne* de Loriol (1890 : 87, pl. 11, fig. 6), from the Upper Oxfordian of the Bernese Jura, is a smaller shell.

Subgenus ***RHABDOCONCHA*** Gemmellaro 1878

Pseudomelania* (*Rhabdoconcha*) *wilderriensis sp. nov.

Pl. 25, fig. 10

1960. *Pseudomelania valfinensis* de Loriol ; Joubert, pl. 11, fig. 13*b* (*non* de Loriol).

Diagnosis. Shell large (original height of holotype c. 120 mm.), acute (spire angle 12°), with feebly and evenly convex whorls the height of which is about three-quarters of the diameter ; last whorl broadly convex at periphery. Surface ornamented with numerous fine spiral striae ; growth-lines forming a simple, shallow arch the chord of which is moderately prosocline. (The aperture is not preserved intact.)

HOLOTYPE. No. G.76414. The only specimen.

LOCALITY AND HORIZON. Wilderri hill, 11 miles S.S.W. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones.

REMARKS. When first illustrated, the shell now described was identified as *Pseudomelania valfinensis* de Loriol (1887 : 141, pl. 14, fig. 7). Its spiral ornament, which is clearly seen on parts of the holotype (although the surface is rather eroded), resembles that of this European Lower Kimmeridgian species, but its spire is more acute.

Genus ***BOURGUETIA*** Terquem & Jourdy 1870

Bourguetia saemanni (Oppel)

Pl. 25, figs. 8, 9

1814*a*. *Melania striata* J. Sowerby : 101, pl. 47 (*non* Perry, 1811).
1853. *Phasianella striata* (Sow.) ; d'Orbigny : 322, pl. 324, fig. 15, pl. 325, fig. 1.
1856. *Phasianella saemanni* Oppel : 507.
1881. *Bourguetia striata* (Sow.) ; de Loriol : 31, pl. 8, fig. 5.
1905. *Bourguetia striata* (Sow.) ; Dacqué : 143.
1909. *Bourgouetia* (*sic*) *striata* (Sowerby) ; Brösamlen : 284.
1938. *Bourguetia saemanni* (Oppel) ; Cox : 60.
1960. *Bourguetia saemanni* (Oppel) ; Joubert, pl. 12, figs. 2*a*, *b*.

MATERIAL. Several specimens.

LOCALITIES AND HORIZONS. Nchia stream, 2 miles W.N.W. of Mandawa, Tanganyika ; Callovian. Scarp face, eastern margin of Makoko plain, Bagamoyo hinterland, Tanganyika ; Upper Oxfordian. Low hills at Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones. Wilderri hill, 11 miles S.S.W. of Rahmu ; same formation as the last. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya ; Kimmeridgian, Hereri Shales.

REMARKS. The occurrence in East Africa of this well-known large European Jurassic shell, already recorded from the Kimmeridgian of Somaliland by Dacqué, is of great interest. In Europe the range of this species is from the Bajocian to the Lower Kimmeridgian.

Family **COELOSTYLINIDAE**

Genus ***COELOSTYLINA*** Kittl 1894

Coelostylina stockleyi sp. nov.

Pl. 26, figs. 3*a*, *b*, *c*

SPECIFIC NAME. After Mr. G. M. Stockley, formerly Director of the Geological Survey of Tanganyika.

Diagnosis. Shell of medium size for the genus (original height of holotype c. 12 mm.), phasianelliform, height of aperture about two-fifths of that of shell ; spire angle about 35°. Protoconch unknown (broken off in holotype). Spire whorls rather high, moderately convex, abutting simply at the sutures ; last whorl broadly convex at periphery. Base evenly convex in outline, not much extended ; no clearly open umbilicus is seen, but a small cleft in the base of the holotype may be the opening of a very narrow one. Aperture ovate, angular posteriorly, not oblique. Columellar lip straight and vertical although not much extended, slightly undercut by a well-marked sinus which separates it from the basal margin of the aperture. Outer lip orthocline ; details of parietal region not well seen in available specimen. Growth-lines obscure.

Holotype. No. GG.10281. The only specimen.

Locality and horizon. 2½ miles N.N.W. of Kidugallo, Tanganyika ; Bajocian.

Remarks. The apertural characters of this species and of the one described next agree with those of members of the family Coelostylinidae rather than with those of the pseudomelaniid subgenus *Oonia*, which they greatly resemble in the general morphology of the shell. The only Bajocian and at the same time the geologically youngest representative of the family hitherto recognized, is *Coelostylina brasili* Cossmann (1913*b* : 217, pl. 8, figs. 58, 59), from France. This form is more than twice the height of the species now described and has a less distinct sinus at the foot of its columella. Cossmann pointed out that certain species from the Bajocian of England described by Hudleston (1891 : 251–255, pl. 19, figs. 11–15) under the generic name *Phasianella* might well belong to *Coelostylina*. Specimens identified by him (1891, pl. 19, figs. 11*a*, *b*, 14*b*) as *Phasianella elegans* Morris & Lycett (a Bathonian *Oonia*) are very similar to the African species now described.

Coelostylina mandawaensis sp. nov.

Pl. 25, figs. 4*a*, *b*, 5*a*, *b*, 6*a*, *b*, 7*a*, *b*

Diagnosis. Shell of medium size for the genus (height of largest specimen 13 mm.), ovate-conical, aperture occupying rather less than one-half of total height. Protoconch minute, dome-like. Spire slightly cyrtoconoid, acute, consisting of feebly to moderately convex whorls abutting simply at the sutures ; last whorl broadly rounded at periphery. Base extended, evenly convex in outline ; no clearly open umbilicus is seen, but a small median cleft in the base may be the opening of a very narrow umbilicus. Aperture much higher than broad. Columellar lip extended, straight and vertical or leaning slightly to the left adapically and joining the basal margin in a very abrupt curve, the junction forming a slight beak-like protuberance. Margin of columellar lip narrowly reflected, partly covering umbilical cleft and continued across parietal region by margin of a thin inductura which passes beneath the outer lip. Growth-lines prominent on last whorl, prosocline near the suture, orthocline below.

Holotype and paratypes. Holotype, no. GG.10283. Numerous paratypes, including nos. GG.10284–86.

LOCALITIES AND HORIZON. Near site of Mandawa well no. 1, Tanganyika (type-locality). Mandawa well no. 6, Tanganyika, at depths 58–60 feet, 60–62 feet, 62–64 feet, 64–66 feet, 66–68 feet. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika (a specimen preserved in matrix adherent to a crushed specimen of *Protocardia bipi*). All Bajocian (?),

REMARKS. There has been some difference of opinion as to the distinction between *Coelostylina* and *Omphaloptycha*, a genus founded by von Ammon two years earlier. According to the criteria accepted by Cossmann (1909 : 47), the species now described might appear better referable to *Omphaloptycha*, its ovate-conical form and the feeble convexity of its whorls distinguishing it from the type-species of *Coelostylina*. Nevertheless, in a later work Cossmann (1913*b* : 211–218, pl. 15) refers a number of species, very much like the African shell, to *Coelostylina*. I think it undesirable to separate this form generically from *C. kidugalloensis* sp. nov., described above, and I therefore also include it in *Coelostylina*. It differs from *C. kidugalloensis* in its less convex whorls and its more extended and relatively narrower aperture.

Superfamily **LOXONEMATACEA**

Family **ZYGOPLEURIDAE** Wenz 1938

Genus ***ZYGOPLEURA*** Koken 1892

Zygopleura mandawaensis sp. nov.

Pl. 25, figs. 3*a*, *b*, 11

DIAGNOSIS. Shell rather small (height of largest specimen about 12 mm. when complete), acute ; spire angle abut 15°. Protoconch finely pointed. Whorls with an imbricate appearance, due to presence of an obtuse angulation at about the lower quarter of their height, above which their outline is flattened ; the angulation forms the periphery of the last whorl. Ornament consisting of strong, rounded collabral costae separated by intervals of about the same width ; in some specimens the costae are opisthocyrt for the whole of their exposed length, while in others they are parasigmoid, with the part above the angulation opisthocyrt and the part below prosocline. On the penultimate or the last whorl the costae fade away, so that the surface bears only collabral threads or rugae. Base smooth, feebly convex to almost flat in outline. Outer lip with broad sinus corresponding to opisthocyrt part of costae.

HOLOTYPE AND PARATYPES. Holotype, no. GG.10287 (*ex* B.P. Coll.), a specimen associated with the holotype of *Ceratomya tanganyicensis*, sp. nov. There are several paratypes, including nos. GG.10288–89, none complete.

LOCALITIES AND HORIZON. Lihimaliao creek traverse, Mandawa area, Tanganyika (type-locality). Mandawa well no. 6, Tanganyika, at the following depths : 58–60 feet, 60–62 feet, 62–64 feet, 64–66 feet. Near site of Mandawa well no. 1. All Bajocian (?).

REMARKS. The Middle Jurassic species of *Zygopleura* so far described are relatively large forms, 50–100 mm. in height, and it is necessary to turn to the Lias to find any species with which the present one could be brought into comparison. *Z. subrugosa* McDonald & Trueman (1921 : 330, text-fig. 18), from the Upper Lias of Grantham, Lincolnshire, resembles the East African species in its angular whorl profile and does not greatly exceed it in height, but it is a less acute shell, the periphery of its whorls is much more protruding, and the number of costae on each whorl is greater.

Superfamily **LITTORINACEA**

Family **PURPURINIDAE** Zittel 1895

Genus ***PURPUROIDEA*** Lycett 1848

Purpuroidea supraliasica sp. nov.

Pl. 28, figs. 4*a*, *b*

Diagnosis. Shell rather small for the genus (height of largest specimen c. 30 mm.), conical-ovate, diameter two-thirds of height, spire elevated, acute, occupying up to one-half of total height. Whorls with almost flat sides, slightly convergent adapically, separated from narrow sutural ramp by shoulder bearing large rounded tubercles. Base extended, slightly convex in outline, and limited by an obtuse, rounded-off angulation that continues the line of the suture. Parietal lip straight, oblique, with a narrow, distinctly margined layer of callus, and joining the apparently very short columellar lip (not preserved complete in the available specimens) in an obtuse angle. Outer lip not preserved in the available specimens, in which any finer ornament that may have been present has been obliterated by erosion.

Holotype and paratypes. Nos. GG.10264 and GG.10265–69 respectively, six specimens in all.

Locality and horizon. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

Remarks. This shell is comparable in shape to the much larger species *Purpuroidea berberica* Dubar (1948 : 94, pl. 7, figs. 6–8), from the Middle Lias of Morocco, and has a similar tuberculate shoulder to its whorls. Its base, however, is more extended than in that species.

Purpuroidea aff. ***gigas*** (Thurmann & Étallon)

Pl. 26, fig. 2 ; Pl. 27, fig. 15

1861. Aff. *Purpura gigas* Thurmann & Étallon : 138, pl. 13, fig. 121.
1874. ?Aff. *Purpurina subnodosa* (Roemer) ; Brauns : 169 (*non Natica*? *subnodosa* Roemer).
1881. Aff. *Purpuroidea gigas* (Étallon) ; Schlosser : 68, pl. 10, figs. 4, 4*a*.
1909. ?Aff. *Purpuroidea subnodosa* (Roemer) ; Brösamlen : 251 (*non* Roemer sp.).

Material. One specimen (no. GG.10328).

Locality and horizon. ¾ mile N.W. of Mbinga, Tanganyika ; Upper Kimmeridgian.

Remarks. The specimen now recorded is a large internal mould, 153 mm. high. Its apical whorls are broken away, but the original height of its spire may be estimated as 60 mm. The maximum diameter of the last whorl is about 130 mm. The last whorl has a rounded-off shoulder bearing large blunt tubercles, about nine in number, and above the shoulder is a sutural ramp of steadily increasing breadth which eventually forms an angle of about 45° with the axis of the shell. The tubercles and ramp are not seen on the mould of the earliest preserved whorls. The outer face of the last whorl is of feeble convexity and more or less vertical, its outline merging in a broad curve into that of the base, which is strongly excavated at the beginning of the short neck of the specimen. It is improbable that an umbilicus was present in the original shell.

Schlosser (1881) placed *Natica? subnodosa* Roemer (1836 : 157, pl. 10, fig. 10) in the synonymy of *Purpuroidea gigas* but did not adopt the earlier of the two specific names. Brösamlen (1909) accepted this synonymy and adopted Roemer's name. Examination of Roemer's figure of *N.? subnodosa*, however, raises considerable doubt as to whether this represents a *Purpuroidea* at all. It illustrates a specimen with a wide, flat sutural ledge, separated by a sharp, obscurely nodose angulation from the vertical outer face of the whorl. No difference in the thickness of the wall of the shell would produce a difference in the form of the internal mould comparable to that between Roemer's figure and the illustrations of *P. gigas* given by Thurmann & Étallon and by Schlosser. Moreover, I have recently had occasion to study a specimen from the Jurassic of Tunisia resembling Roemer's figure of *Natica? subnodosa*. The specimen in question recalls the Hettangian species *Ampullaria carinata* Terquem, which Cossmann (1913*b* : 174, pl. 9, figs. 14–17) has included in the genus *Tretospira* Koken. It may, therefore, be suggested that Roemer's figure represents a specimen belonging to that genus. Unfortunately, no specimens from northern Germany of the species which Brauns records as *Purpurina subnodosa* (Roemer) and states is characteristic of the Kimmeridgian are available to me, but it is to be suspected that its identification with Roemer's species is incorrect. Brauns states that specimens of the species reach a height of 180 mm. and a diameter of 150 mm. The specimen from East Africa now recorded agrees quite well with the illustrations of *P. gigas* given by the authors cited, but it seems desirable to qualify its specific determination.

Superfamily **CERITHIACEA**

Family **PROCERITHIIDAE**

Genus ***PROCERITHIUM*** Cossmann 1902

Subgenus ***RHABDOCOLPUS*** Cossmann 1906

Procerithium (Rhabdocolpus) mandawaense sp. nov.

Pl. 27, figs. 9*a*, *b*, 10*a*, *b*, 11*a*, *b*, 12*a*, *b*

Diagnosis. Shell of medium size for the subgenus (height of largest specimens, when complete, c. 8 mm.) ; spire angle varying from about 15°–20°. Protoconch elevated, acute, of about 2½ smooth whorls. Succeeding whorls with flat to feebly concave outer face and broad, angularly impressed sutural region. Ornament consisting of collabral ribs which extend right across the whorls except for the impressed sutural region, and are overridden by spiral threads. Collabral ribs narrow but moderately strong, straight or opisthocyrt to a varying extent, numbering 10–12 on the later whorls, and separated by intervals about twice their width. Spiral threads on spire whorls most commonly 5, more rarely 6 or even more, one forming each border of the sutural depression ; in some specimens they are almost equal in strength and evenly distributed, while in others they are unequal, alternating in strength or quite irregularly arranged. Small granules situated at intersections of collabral ribs and spiral threads are present on uppermost and lowest of the latter in most specimens, but in a few specimens on uppermost only, and in some on intermediate threads also ; strongest granules pointed, majority rounded. Base evenly convex, ornamented with strong spiral threads. Aperture (broken in most specimens) apparently evenly rounded.

HOLOTYPE AND PARATYPES. Holotype, no. GG.10290, *ex* B.P. Coll. Many paratypes, including nos. GG.10291–93.

LOCALITIES AND HORIZONS. Mandawa well no. 6, Tanganyika, at the following depths : 38–40 feet, 44–46 feet, 46–48 feet (very common), 48–50 feet, 50–52 feet (common), 52–54 feet, 56–58 feet, 58–60 feet, 60–62 feet, 62–64 feet, 64–66 feet, 66–68 feet, 68–70 feet. Mandawa well no. 7, depth 92–100 feet. Bajocian (?).

REMARKS. The muricate type of ornament present in this species is found in both the subgenera *Rhabdocolpus* and *Xystrella,* although in the more typical species of the latter such ornament is more coarsely developed. According to Cossmann the most important distinction between the two subgenera is that the aperture is rounded in *Rhabdocolpus* and quadrangular in *Xystrella* ; hence, if this criterion is accepted, the species now described must be included in *Rhabdocolpus.* Its ornament differs in detail from that of any described European species.

Genus ***EXELISSA*** Piette 1860

Exelissa africana sp. nov.

Pl. 27, figs. 2*a*, *b*, 3*a*, *b*, 4*a*, *b*, 5*a*, *b*

DIAGNOSIS. Of medium size for the subgenus (height of largest specimens about 8 mm.), conical to cyrtoconoid, acute, mean spire angle most commonly about 10°. Protoconch finely pointed. Whorls high, tending to be loosely coiled, with flat to feebly convex outer face and wide, well impressed sutural region. Ornament consisting of collabral ribs overridden by spiral threads. Collabral ribs confined in many specimens to adapical half of whorls and strongest near the suture, but stretching in some specimens from suture to suture, prosocline, straight to rather strongly opisthocyrt ; their number, breadth and distance of spacing varying in different specimens. Spiral threads 8–10 or more on later whorls, subequal to distinctly unequal, present on the entire surface, although least conspicuous near the adapical suture when the collabral ribs there are strong. When the collabral ribs are well developed small tubercles are present where the ribs are crossed by spiral threads. Base evenly convex, ornamented only with strong spiral threads. Last whorl tending to become slightly disjunct, deviated, and narrower in cross-section just before the aperture. Aperture almost circular, but extending obliquely below the foot of the columella, so that the inner lip is situated well to left of axis of shell.

HOLOTYPE AND PARATYPES. Holotype, no. GG.10295, *ex* B.P. Coll. About 50 paratypes (mostly imperfect) including nos. GG.10294, GG.10296–97.

LOCALITIES AND HORIZON. Mandawa well no. 6, Tanganyika, at depths 50–52 feet, 52–54 feet, 54–56 feet, 56–58 feet, 58–60 feet, 66–68 feet, 68–70 feet, 70–72 feet. Near site of Mandawa well no. 1. All Bajocian (?).

REMARKS. This species could be described as an *Exelissa* with the ornament of a *Rhabdocolpus*. It is probable that *Exelissa* is a polyphyletic genus, its various species, characterised by the disjunct and deviated condition of the last whorl just before it reaches the aperture, having been derived independently from various groups of *Procerithium*. The taxonomic implications of this theory cannot, however, be explored here. After careful study of the series of specimens now described, the conclusion has been reached that they all belong to the same species, although the outline of the whole shell and of individual whorls varies considerably and the *Exelissa* condition of the apertural region of the last whorl seems to be more marked in some specimens than in others.

Exelissa dodsoni sp. nov.

Pl. 26, figs. 1*a*, *b*

SPECIFIC NAME. After Mr. R. G. Dodson, of the Geological Survey of Kenya, collector of the type-specimens.

DIAGNOSIS. Shell of medium size for the genus (usual height 6–7 mm.), conical or slightly cyrtoconoid, spire angle about 15°. Protoconch elevated, acute, but eroded in available specimens, so that the number of whorls forming it is uncertain. Teleoconch whorls with flat outer face and broad, well impressed sutural region. Ornament consisting of collabral ribs overridden by spiral threads. Collabral ribs on most whorls narrow but prominent, orthocline or slightly prosocline, separated by slightly broader intervals, and extending right across the outer face of the whorl, their upper end projecting at the impressed sutural region ; they number about 12 on the later whorls on which they are developed. On the later whorls, however, especially the last, the lower half of each rib, or even the whole rib, tends to be only faintly developed. Spiral threads 6–7 in number on the spire whorls, where they are mostly unequal in strength and extend on to the sutural depression. Small granules may be present at the intersections of the spiral and collabral elements, particularly on the thread forming the lower border of the sutural depression. Last whorl tending to become narrower in cross-section and slightly disjunct just before the aperture. Base evenly convex, ornamented with spiral threads. Aperture oval, broader than high, extending obliquely below the foot of the columella, so that the inner lip is situated well to the left of the axis of the shell.

Holotype and paratypes. The type material consists of numerous specimens preserved in relief (but in many cases in an eroded condition) on a bedding plane of a piece of hard limestone registered as no. G.79190. A specimen represented in Pl. 26, fig. 1*b* (middle of left-hand side of figure) is taken as holotype.

Locality and horizon. Hagardulun, 25 miles N.E. of Tarbaj, N.E. Kenya ; Bathonian–Callovian, Bur Mayo Limestones.

Remarks. This species was originally recorded (Thompson & Dodson 1960 : 32) as *Procerithium* (*Rhabdocolpus*) sp. The same remark applies to it as to *Exelissa africana*, described above ; it is an *Exelissa* (as determined by the characters of the aperture) with the ornament of a *Rhabdocolpus*. It is less slender than *E. africana* but more strongly ribbed. The general form of the shell and the ornament are much more similar to those of *Procerithium* (*Rhabdocolpus*) *mandawaense*, also described above, but its costae are rather more numerous and, generally, straighter than in that species and it has a greater number of spiral threads. Enough can be seen of the apertural characters of *P. mandawaense* to show that it cannot be included in *Exelissa*.

Genus ***PARACERITHIUM*** Cossmann 1902

Paracerithium lonjiense sp. nov.

Pl. 27, figs. 6*a*, *b*, 13*a*, *b*

Diagnosis. Shell small (height of holotype 3·5 mm.), rather stoutly conical, spire angle about 38°. Protoconch conical, with its initial whorl minute. Early whorls evenly convex, later whorls with a well-marked shoulder separating a concave sutural ramp, which meets the preceding whorl almost tangentially, from a feebly convex outer face which on the later whorls is inclined inward abapically and on the last whorl merges in an even curve with the moderately convex base. Ornament consisting of strong, rounded collabral ribs which tend to form tubercles at the shoulder on the last whorl and are crossed by spiral cords (one at the shoulder and two on the outer face) separated by much broader intervals ; the base bears only spiral cords which are more closely spaced than those on the remainder of the surface. Aperture not preserved intact.

Holotype and paratypes. Holotype, no. GG.10298, *ex* B.P. Coll. ; several paratypes (including no. GG.10299), all but one juvenile shells.

Locality and horizon. Mandawa–Lonji creek traverse, Mandawa area, Tanganyika ; Lower Kimmeridgian.

Remarks. This species has the same general aspect as various representatives of *Paracerithium* from the Jurassic of France figured by Cossmann (1913*b*, pl. 13, figs. 28–63), but differs from all of them in details of ornament.

Genus *CRYPTAULAX* Tate 1869

Cryptaulax bussagensis (Cossmann)

Pl. 27, figs. 1*a*, *b*

1843. *Cerithium pentagonum* d'Archiac : 384, pl. 31, fig. 6 (*non* Bronn, 1831).
1851. *Cerithium pentagonum* d'Archiac ; Morris & Lycett : 39, pl. 9, fig. 22.
1863. *Cerithium ? neglectum* Lycett : 92, pl. 44, fig. 21 (*non* Deshayes, 1833).
1885. *Cerithium pentagonum* d'Archiac ; Cossmann : 103.
1899. *Cerithium bussagense* Cossmann : 135.
1913*b*. *Cryptaulax pentagonum* (d'Archiac) ; Cossmann : 104, pl. 4, figs. 100–102.

MATERIAL. One specimen (no. GG.10464).

LOCALITY AND HORIZON. 2 miles W. of Tengeni (village on Pangani river), in Mbuzi Mkubwa stream, Tanganyika ; Bathonian (?).

REMARKS. This specimen, a small cerithiiform shell lacking its apical whorls but originally about 16 mm. high, has flat whorls bearing five rounded transverse costae with intervals of about the same width. The costae are in almost uninterrupted alignment on successive whorls and are very slightly prosocline. The specimen agrees well with examples of the species from the Great Oolite of England. As Bronn's *Cerithium pentagonum* cannot be dismissed as a *nomen nudum* it is necessary to find a replacement for the same name proposed by d'Archiac for the Bathonian species. The name *Cerithium bussagense* was proposed by Cossmann as a substitute name for the similarly homonymous *C. neglectum* Lycett, founded on a specimen consisting merely of the earlier whorls of d'Archiac's *C. pentagonum*, and it is now adopted for this species.

Superfamily STROMBACEA

Family APORRHAIDAE Philippi 1853

Genus *PIETTEIA* Cossmann 1904

Pietteia stockleyi sp. nov.

Pl. 27, figs. 7*a*, *b*, 8*a*, *b*, 14*a*, *b*, *c*

SPECIFIC NAME. After Mr. G. M. Stockley, formerly Director of the Geological Survey of Tanganyika.

DIAGNOSIS. Shell small (height of holotype, a specimen defective anteriorly, 7·9 mm.), rather slender, mean spire angle about 20°. Protoconch elevated, rather mammilliform, of two smooth whorls. Later whorls about 5½, rather high in proportion to their diameter, with a moderately wide sutural ramp which forms an angle of about 45° with the axis of the shell and an almost flat outer face, which is vertical or even inclined inward abapically on the last whorl, and is separated from the feebly excavated, well extended neck of the shell by an obtuse angulation. Dominant ornament consisting of spiral threads ; three principal threads, with a secondary thread varying in strength intercalated in each interval on the later whorls, are present both on the outer face and on the ramp, and further threads, irregularly spaced but alternating in strength more or less regularly, ornament the neck. In addition, weak collabral ribs, most prominent at the ramp angle, are present except on the last whorl, the number on the penultimate whorl being 10. On the last whorl the ramp angle bears a short spine half a volution back from the outer lip. Aperture narrow, not preserved intact in the available specimens. Outer lip thickened, with a single short digitation at the position of the ramp angle.

HOLOTYPE AND PARATYPES. Holotype, no. GG.10359. Four paratypes, including nos. GG.10300–01. All *ex* B.P. Coll.

LOCALITIES AND HORIZON. Near site of Mandawa well no. 1, Tanganyika (holotype). Mandawa well no. 6, from depths 46–48 feet, 58–60 feet and 60–62 feet. All Bajocian (?).

REMARKS. Although the outer lip is imperfect even in the best-preserved specimen, there is little doubt that this species is a *Pietteia* related to *P. hamus* (Eudes-Deslongchamps) (*see* Hudleston, 1888 : 113, pl. 4, figs. 6*a–d* ; pl. 7, fig. 9) and *P. unicarinata* (Hudleston) (1888 : 118, pl. 4, figs. 13*a–c*), both of which occur in the Bajocian of England. It differs from these forms in details of ornament, and in *P. unicarinata* the ramp angle bears two spines on the last whorl, respectively at one-quarter and one-half of a volution back from the aperture.

Pietteia mandawaensis sp. nov.

Pl. 30, figs. 8*a*, *b*

DIAGNOSIS. Shell small (height of holotype, a specimen defective anteriorly, 8.0 mm.), spire slightly cyrtoconoid, its mean angle probably about 30° originally (but affected by slight crushing in the available specimens). Protoconch bluntly conical, of $2\frac{1}{2}$ smooth whorls. Later whorls about 6, of moderate height, the last three with a fairly wide sutural ramp which forms an angle of about 45° with the axis of the shell, and an almost flat outer face which is inclined inward abapically and on the last whorl is separated from the feebly excavated neck of the shell by a well-marked, obtuse angulation. Ornament consisting of spiral threads crossed by rounded collabral ribs which are well marked on the earlier whorls but become obsolete on the penultimate and last. Three spiral threads of primary strength are present on both the outer face and the ramp, secondary threads of varying strength occupying their intervals, and further threads ornament the neck. The number of collabral ribs on the pre-penultimate whorl is about 12. On the last whorl a short spine is situated at the ramp angle half a volution back from the outer lip. Aperture not preserved intact.

HOLOTYPE AND PARATYPES. Holotype, no. GG.10382. Three paratypes, nos. GG.10383–85.

LOCALITY AND HORIZON. Near site of Mandawa well no. 1 ; Bajocian (?).

REMARKS. This species resembles *P. stockleyi*, described above, in size and in the nature of its ornament, but its whorls, including those of the protoconch, are much lower in proportion to their diameter than in that species, and its collabral ribs are stronger and more numerous. In all four specimens crushing has increased the apparent angle of the spire when one of the flattened sides of the shell is viewed, but deformation of this nature does not seem to be entirely responsible for the considerable difference in the height of the whorls.

Pietteia dusseensis sp. nov.

Pl. 27, figs. 16*a*, *b*, *c*

Diagnosis. Shell rather small (height of holotype c. 13 mm.), spire moderately broad, its angle about 25°. Protoconch unknown. Preserved whorls with a flattened, vertical outer face separated by a rounded-off angulation from a broad sutural ramp which forms an angle of about 45° with the axis of the shell. Ornament, except on later part of last whorl, consisting of rounded collabral ribs and of fine spiral threads overriding them ; the ribs, which are most prominent at the ramp angle, where some swell out to form tubercles, are separated by intervals about three times as wide ; the number on the penultimate whorl is about 12. The terminal rib is particularly prominent, constituting a varix. Later formed part of last whorl without ribs, but with a single prominent tuberculate carina at the ramp angle, which forms the periphery ; base convex just below periphery, but well excavated at the beginning of the neck of the shell ; spiral threads, separated by broader intervals, are present on the ramp of the last whorl and on the base. Aperture and rostrum not preserved ; the cross-section of the proximal part of a single broken-off labral digitation is seen in the holotype.

Holotype. No. G.76405. The only specimen.

Locality and horizon. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones.

Remarks. This species is referred to *Pietteia* on account of the nature of its ornament and of the evidence that a single stout labral digitation was present. No closely comparable Upper Jurassic species can be cited. The French Bajocian species *Pietteia rarispina* (Schlumberger) (Piette 1867 : 100, pl. 20, figs. 1–3) is more slender and lacks tubercles on the peripheral carina of its last whorl. Such tubercles are found on its contemporary species *P. lotharingica* (Schlumberger) (Piette 1867 : 105, pl. 21, figs. 1–11), which, however, is a much more slender shell.

Genus ***HARPAGODES*** Gill 1869

Harpagodes aff. ***oceani*** (Brongniart)

Pl. 28, fig. 3

1821. Aff. *Strombus Oceani* Brongniart : 554, 570, pl. 7, fig. 2.
1867*b*. Aff. *Pterocera Oceani* (Brongniart) ; de Loriol : 40, pl. 4, figs. 4, 5.
1891. Aff. *Harpagodes Oceani* (Brongniart) ; Piette : 456, pl. 45, figs. 1, 2 ; pl. 48, fig. 1 ; pl. 65, figs. 5–7 ; pl. 80, fig. 1 ; pl. 81, figs. 1–3.
1910. Aff. *Strombus Oceani* Brongniart ; Lemoine, pl. 176.

Material. Four specimens (nos. GG.10319–22).

Localities and horizon. Along Mbaru stream, 1 mile N.W. of Mbinga, Tanganyika. Also along Manyuli stream, just W. of Nautope and ¾ mile N.W. of Nautope, Tanganyika. Callovian.

Remarks. The best preserved specimen retains the expanded outer lip, on which are four fairly evenly spaced rounded ribs which terminated in labral digitations (now broken off). No doubt a further digitation, also no longer preserved, adhered to the spire. Rounded spiral cords of secondary strength occupy the intervals between the main ribs, three being visible in the least eroded interval. This specimen agrees very well with some of the above-cited figures of the typical *H. oceani*, for example, Piette's pl. 45, fig. 1, and differs from any of that author's figures of other species of *Harpagodes*. It is, of course, possible that, if perfectly preserved specimens were available, the form now recorded would prove to differ from Brongniart's species in the details of its labral digitations. *H. oceani* occurs typically in Europe in the Upper Kimmeridgian (Portlandian of French authors) and is not known from any horizon as low as Oxfordian, the latest possible age of the East African specimens.

Harpagodes thirriae (Contejean)

Pl. 28, figs. 1, 2

1860. *Pterocera carinata* Contejean : 243 (*non* Roemer sp.).
1860. *Pterocera Thirriae* Contejean : pl. 9, figs. 1, 2.
1861. *Pterocera Thirriai* (*sic*) Ctj. ; Thurmann & Étallon : 133, pl. 12, fig. 109.
1861. *Pterocera Oceani* Delab. ; Thurmann & Étallon : 133, pl. 12, fig. 110.
1891. *Harpagodes Thirriae* (Contej.) ; Piette : 452, pl. 55, figs. 2, 3 ; pl. 59, figs. 1, 2 ; pl. 68, figs. 2–5 ; pl. 71, figs. 1, 2.
1897. *Harpagodes* cf. *Thirriae* (Contej.) ; Futterer : 615.
1960. *Harpagodes oceani* (Brongniart) ; Joubert, pl. 12, figs. 3*a–c*.

Material. Several specimens.

Localities and horizons. 10½ miles S.W. of Raiya hills ; N. of Figfirya, northern Raiya hills ; 1 mile S.W. of Melka Dakacha ; 3 miles N.E. of Melka Dakacha ; all N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

Remarks. This species is easily recognized by the broad, strongly projecting keel which is present on the middle of the later part of the last whorl. In addition, two faint spiral ribs are visible below this keel on the internal moulds of which the material studied consists. There are, however, no ribs above the keel corresponding to more posteriorly situated digitations, three of which (including the one adhering to the spire) are shown in Piette's pl. 71. In Europe this species has been recorded only from the Kimmeridgian.

Superfamily **NATICACEA**

Family **AMPULLOSPIRIDAE** Cox 1930

Genus ***AMPULLOSPIRA*** Harris 1897

Ampullospira besairiei sp. nov.

Pl. 28, figs. 10, 11*a*, *b*, 12*a*, *b*, 13

Specific name. After Dr. H. Besairie, collector of specimens of this species from Madagascar.

Diagnosis. Shell attaining a moderately large size for the genus (height of largest specimen, from Madagascar, 52 mm.), height well in excess of diameter in undistorted specimens ; height of aperture equal to or slightly exceeding one-half of that of shell. Apex acute, early whorls strongly and evenly convex, later whorls developing a broad, almost horizontal, slightly concave sutural shelf, separated by a rounded-off angulation from the moderately convex outer face of the whorl. Last whorl globose, very broadly convex at the periphery, which lies approximately along the prolongation of the last suture, and with the evenly convex curve of its outline continuous as far as the aperture in most specimens ; in some specimens, however, the outline is even slightly concave near the aperture. Umbilical opening a narrow cleft in some specimens, umbilicus perhaps absent in others. Aperture higher than broad. Columellar lip concave, or else almost straight and leaning slightly to the left, and forming an obtuse angle or merging in a broad curve with the parietal lip ; margin of columellar lip narrowly reflected, with a slightly detached margin, partly covering the umbilical cleft, and continued across the parietal region to the top of the outer lip by the margin of a narrow but moderately thickened inductura. Outer lip imperfect in all available specimens ; growth-lines only slightly prosocline.

Holotype and paratypes. Holotype, no. GG.10304, *ex* B.P. Coll. Several paratypes, including nos. GG.10305, G.65864–68, 65884–95.

Localities and horizon. Lihimaliao creek, at a point near Mbaru creek, Mandawa area, Tanganyika (type-locality) ; near site of Mandawa well no. 1, Tanganyika (young specimen) ; Mont Bory, Maevatanana district, N.W. Madagascar ; S.W. of geodetic point Antery, Maevatanana district, N.W. Madagascar. All probably Bajocian.

Remarks. This species much resembles *Ampullospira sharpei* (Morris & Lycett) (1851 : 46, pl. 11, fig. 22) from the Bathonian of England, but in that species the spire is higher than in the form now described, the sutural shelf slopes slightly, is not concave, and is present at an earlier stage of growth, and the last whorl is more angular in outline. In the type species of *Ampullospira*, *A. canaliculata* (Morris & Lycett) (1851 : 45, pl. 11, figs. 23, 23*a*), from the Bajocian and Bathonian of England, the sutural shelf is narrower and the margin of the columellar lip scarcely reflected.

Ampullospira dejanira (d'Orbigny)

Pl. 28, fig. 8

1852. *Natica Dejanira* d'Orbigny : 209, pl. 296, figs. 1, 2.
1960. *Ampullospira eudora* (d'Orbigny) ; Joubert, pl. 12, figs. 1*a*, *b* (*non* d'Orbigny sp.)

MATERIAL. Several specimens (nos. G.76392–96, G.76398, G.76406–08).

LOCALITIES AND HORIZON. Wilderri hill, 11 miles S.S.W. of Rahmu, N.E. Kenya ; low hills at Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. Upper Oxfordian, Seir Limestones.

REMARKS. The specimens included in this species are characterized by their elevated spire, which occupies from rather more than one-third to about one-half of the total height of the shell, by their highly and evenly convex whorls, and by the considerable breadth of the last whorl, the maximum diameter of which much exceeds the height of the aperture and is approximately equal to the total height of the last whorl. An umbilicus appears to be absent. The largest specimen, when complete, was about 55 mm. high and the diameter of its last whorl was about 44 mm. When first recorded, these specimens were referred to the species *Ampullospira eudora* (d'Orbigny) (1852 : 211, pl. 297, figs. 1–3), which has an equally elevated spire, but they differ from that species in their relatively broader and more strongly convex last whorl, and agree more closely with d'Orbigny's figures of *A. dejanira*, a species which he records from a number of French Upper Oxfordian localities.

Ampullospira quennelli sp. nov.

Pl. 29, figs. 2*a*, *b*, *c*, 3*a*, *b*, *c*

SPECIFIC NAME. After Mr. A. M. Quennell, formerly Director ot the Tanganyika Geological Survey, collector of the holotype.

DIAGNOSIS. Shell of medium size for the genus (height of holotype 34 mm.), globose, height exceeding diameter. Spire slightly obtuse, its height rather less than one-third of that of shell ; spire whorls with moderately convex outer face, separated by a sharp angulation from a flat or slightly concave sutural ledge which is of moderate width on last whorl. Last whorl broadly convex at periphery and with an evenly convex basal outline. Umbilicus apparently absent. Growth-lines slightly prosocline. Breadth of aperture about two-thirds of its height. Details of inner lip uncertain (owing to obscuring matrix).

HOLOTYPE AND PARATYPES. Nos. G.91998, GG.10324–26 respectively. There are, in addition, several internal moulds, mostly deformed by pressure, which probably belong to this species.

LOCALITIES AND HORIZONS. Nchia stream, 2 miles W.N.W. of Mandawa, Tanganyika ; Lonji stream, E.N.E. of Nandenga, Tanganyika ; both Callovian. Imperfect specimens from about the same horizon and probably referable to this species are from the Lonji stream, E.N.E. of Mandenga, from the Lihimaliao stream, at a point ½ mile E. of Njenga, and from the Mbaru stream, at a point 1 mile N.W. of

Mbinga. Just W. of Mabokweni, 4 miles N.W. of Tanga, Tanganyika (type-locality); Kimmeridgian.

Remarks. The specimens now recorded come from two rather widely separated horizons (Callovian and Kimmeridgian), but the material available does not justify their reference to more than one species. The sutural ledge is a little broader in the Kimmeridgian specimen serving as holotype than in the Callovian specimens, but the difference is no greater than is commonly found in specimens of the same species of *Ampullospira*.

The sutural ledge suggests comparison with several forms found in the Bathonian of Europe, for example, *A. gradifera* (Piette) (Cossmann 1885 : 138, pl. 16, figs. 15, 16), but its lower spire distinguishes the present species from any of these forms. In *A. crithea* (d'Orbigny) (1852 : 200, pl. 292, figs. 5, 6), Lower Oxfordian of France, the shell is less globose and the sutural ledge narrower and more excavated.

A species of the genus *Globularia*, " *Natica* " *pelops* d'Orbigny (1852 : 188, pl. 288, figs. 16, 17), from the Upper Lias of France, may be mentioned particularly as closely resembling the present form in the general shape of the shell and in size, but it lacks a sutural ledge.

Genus ***GLOBULARIA*** Swainson 1840

Globularia hemisphaerica (Roemer)

Pl. 28, fig. 9

1836. *Nerita hemisphaerica* Roemer : 156, pl. 10, figs. 7*a*, *b*.
1852. *Natica hemisphaerica* d'Orb. ; d'Orbigny : 204, pl. 294, figs. 1, 2.
1861. *Natica hemisphaerica* d'Orb. ; Thurmann & Étallon : 118, pl. 10, fig. 75.
1868. *Natica hemispherica* (Roemer) ; de Loriol : 43, pl. 3, figs. 3, 4.
1872. *Natica hemispherica* (Roemer) ; de Loriol : 118, pl. 8, figs. 4–6.
1881. *Natica hemispherica* (Roemer) ; de Loriol : 33, pl. 8, fig. 7.
1887. *Natica hemisphaerica* (Roemer) ; de Loriol : 152, pl. 16, fig. 7.
1905. *Natica* cf. *amata* d'Orb. ; Krumbeck : 127, pl. 13, figs. 9*a*, *b*.
1909. *Natica hemisphaerica* (Roemer) ; Brösamlen : 269, pl. 20, fig. 36.
1960. *Globularia hemisphaerica* (Roemer) ; Joubert, pl. 12, figs. 4*a*, *b*.

Material. Four specimens (nos. G.76374, G.76384–86).

Localities and horizon. Melka Dakacha, N.E. Kenya, and 3 miles to the N.E. ; also N. of Figfirya, northern Raiya hills, N.E. Kenya. All Upper Kimmeridgian, Dakacha Limestones.

Remarks. This species, with its very low, obtusely rounded spire, its large last whorl, and its wide, obliquely extended aperture, is easily recognized. In Europe its range extends throughout the Kimmeridgian and probably into the Portlandian.

Globularia phasianelloides (d'Orbigny)

Pl. 29, figs. 1*a*, *b*

1852. *Natica phasianelloides* d'Orbigny : 212, pl. 297, fig. 6.
1872. *Natica phasianelloides* d'Orbigny ; de Loriol : 115, pl. 7, figs. 19, 19*a*.

1874. *Natica phasianelloides* d'Orbigny ; de Loriol : 349, pl. 8, fig. 24.
1960. *Globularia phasianelloides* (d'Orbigny) ; Joubert, pl. 12, fig. 5.

MATERIAL. Two specimens (nos. G.76378, G.76397).

LOCALITIES AND HORIZONS. Low hills at Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya ; Upper Oxfordian, Seir Limestones. 2 miles S. of Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

REMARKS. This species is characterized by its elevated spire, which occupies about one-third of the total height of the shell, by the feeble convexity of its whorls, and by its relatively narrow last whorl, the maximum diameter of which is about equal to the height of the aperture. The larger of the two specimens is about 44 mm. high, with a diameter of 31 mm. The African specimens agree well with published figures of specimens of the species from Europe, particularly those of de Loriol (1872). In Europe the species occurs in the Lower Kimmeridgian.

Globularia hennigi sp. nov.

Pl. 28, figs. 5*a*, *b*, *c*

SPECIFIC NAME. After E. Hennig, an early worker on the Jurassic geology of Tanganyika.

DIAGNOSIS. Shell of small-medium size (height of holotype 16·6 mm.), globose. Spire low, occupying about one-third of the height of the shell, coeloconoid, with the apex very acute. Whorls strongly and evenly convex ; last whorl strongly convex at periphery, and with an evenly convex basal outline ; maximum diameter of last whorl slightly less than height of shell. No umbilicus. Growth-lines moderately prosocline. (The aperture is not preserved intact.)

HOLOTYPE. No. G.76391. The only specimen.

LOCALITY AND HORIZON. 2 miles S. of Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

REMARKS. This species closely resembles *Natica crassitesta* Dietrich (1914 : 124, pl. 11, figs. 18*a*, *b*), from the Neocomian of Tendaguru, but has a slightly less elevated spire. *Natica venelia* de Loriol (1874 : 341, pl. 8, figs. 9–12), from the Portlandian of Boulogne, France, has a slightly higher spire and strongly pronounced growth-rugae. The French Bathonian form *Natica lanceolata* Piette, transferred to *Ampullina* and figured by Cossmann (1885 : 137, pl. 3, fig. 24 ; pl. 16, fig. 32), also has a higher spire.

Family **NATICIDAE** Gray 1834

Genus ***PICTAVIA*** Cossmann 1925

Pictavia tanganyicensis sp. nov.

Pl. 28, figs. 6*a*, *b*, *c*, 7*a*, *b*

DIAGNOSIS. Shell small (height of largest specimen, when complete, c. 8 mm.), ovate-conical, diameter about two-thirds of height, aperture occupying slightly less than one-half of total height. Protoconch conical, with minute apex. Spire acute, conical, consisting of feebly to moderately convex, smooth whorls, abutting simply at the sutures. Last whorl evenly and strongly convex at periphery, its outline flattening out basally but not becoming definitely concave before reaching the aperture. No distinct umbilicus. Aperture pyriform, peristome not continuous across parietal region. Columellar lip thin, rather extended, straight or almost so, vertical or leaning slightly to the left, and joining the basal margin in an even curve. Outer lip defective or crushed in the available specimens, apparently almost orthocline, although growth-lines are scarcely distinguishable on the surface of the shell.

Holotype and paratypes. Holotype, no. GG.10302 ; several paratypes, including no. GG.10303. *Ex* B.P. Coll.

Locality and horizon. Near site of Mandawa well no. 1, Tanganyika ; Bajocian (?).

Remarks. This species resembles the type-species of *Pictavia*, *Natica pictaviensis* d'Orbigny (1852 : 191, pl. 289, figs. 8–10), from the Bajocian of France, in the general morphology of the shell, but its small size distinguishes it both from that species and from other Middle Jurassic representatives of the genus that have been described previously.

(Superfamily uncertain)

Family **MATHILDIIDAE**

Genus ***PROMATHILDIA*** Andreae 1887

Promathildia aff. ***opalini*** (Quenstedt)

Pl. 29, figs. 6*a*, *b*

1832. Aff. *Turritella elongata* Zieten : 43, pl. 32, fig. 5 (*non* J. Sowerby, 1814).
1856. Aff. *Turritella opalina* Quenstedt : 326, pl. 44, fig. 15 (*non* Adams & Reeve 1850).
1882. Aff. *Turritella opalini* Quenstedt : 300, pl. 196, figs. 20, 21.
1883. Aff. *Cerithium torulosi* Quenstedt, pl. 205, fig. 53.
1884. Aff. *Turritella* (*Mathilda*) *opalina* Quenstedt var. *canina* Hudleston : 200, pl. 7, fig. 9.
1891. Aff. *Turritella* (*Mathilda*) *opalina* Quenstedt ; Hudleston : 231, pl. 17, figs. 3*a*, *b*.
1891. Aff. *Turritella* (*Mathilda*) *opalina* var. *canina* Hudleston ; Hudleston : 232, pl. 17, fig. 4.
1909. Aff. *Turritella opalina* Quenstedt : Brösamlen : 275, pl. 20, fig. 44 ; pl. 21, fig. 1.

Material. One specimen (no. GG.10270).

Locality and horizon. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

Remarks. The specimen, which is 13·5 mm. high, lacks the actual apex, but consists of about 6½ early whorls of an acute, turriculate shell. The whorls, which are strongly and evenly convex, are mostly eroded, but the last one can be seen to be ornamented with about 8 obscurely granose spiral cords.

Hudleston (1891 : 231) suggested that Quenstedt's name *Turritella opalina* might " be accepted as a generalized term for elongate Turritellae of Jurassic age possessed of about six or seven spirals ", and mentioned that the spirals were slightly granulated. His " var. *canina* " from the Dogger (? Upper Lias, Yeovilian) of Blea Wyke, Yorks, has eight spirals and much resembles the small shell now recorded. In Germany Quenstedt's species is particularly characteristic of the " Brown Jura α " but ranges up into the " Brown Jura β " (both Aalenian), and, according to Brösamlen, most specimens have six spirals. The age of the specimen now recorded (Toarcian) is slightly earlier than that of any recorded European occurrence of the species.

The specific name *opalina*, under which Quenstedt described this form in 1856, was a homonym, but his emended name *opalini*, published in 1882, may be adopted.

Subclass *OPISTHOBRANCHIA* Milne Edwards

Order ENTOMOTAENIATA Cossmann

Superfamily **NERINEACEA**

Family **NERINEIDAE** Zittel 1873

Genus ***COSSMANNEA*** Pchelintsev 1927

Cossmannea hennigi (Dietrich)

Pl. 30, fig. 7

1904. *Nerinea Hennigi* Dietrich : 134, pl. 12, fig. 6, pl. 13, figs. 3*a–c*.

MATERIAL. Two specimens (nos. G.48914, G.48917).

LOCALITIES AND HORIZON. Bed of Maimbwi river, and along upper part of tributary to same river, near Tendaguru, Tanganyika ; Upper Kimmeridgian, " *Trigonia smeei* " Bed and slightly below it.

REMARKS. The generic name *Cossmannea* is applicable to the group of species designated as *Nerinea* s.str. by some previous writers, who ignored the fact that the type-species of *Nerinea* should properly be taken as *N. mosae* Deshayes. This group is characterized by concave whorls, a bulging sutural region, the presence of 2–3 internal folds, and the usually relatively large size of the shell.

In *C. hennigi* the concavity of the whorls is only moderate and no tubercles are present on them. There are three strong internal folds. There is a close external resemblance to *Cossmannea desvoidyi* (d'Orbigny) (Cossmann 1898 : 56, pl. 5, figs. 14, 21) which ranges from the Upper Oxfordian to the Tithonian in Europe. *C. desvoidyi* however, has only two internal folds and is slightly more slender. The maximum diameter of the largest specimens of *C. hennigi* now recorded is 29 mm.

Genus ***NERINELLA*** Sharpe 1850

Nerinella ?muelleri Cox

1900. ?*Nerinea Credneri* Müller : 537, pl. 17, figs. 11–13 (*non* Alth 1873, *nec* Zittel 1873).
1954. ?*Nerinella muelleri* Cox : 16.

MATERIAL. One specimen (no. GG.10339).

LOCALITY AND HORIZON. Along Lihimaliao stream at a point about ¾ mile E. of Njenja, Tanganyika ; Upper Oxfordian(?).

REMARKS. The type-specimens of this species came from the locality " 1·5 km. W. of the Mahokondo stream, 24·5 km. N.W. of Kiswere ", where the beds are now known to be Callovian in age. The single ill-preserved fragment of a *Nerinella* now recorded appears to belong to *N. muelleri*, but it does not allow Müller's published description, referred to below in the description of *N. cutleri*, to be amplified.

Nerinella cutleri sp. nov.

Pl. 30, figs. 4*a*, *b*

1914. *Nerinella Credneri* (Müller) ; Dietrich : 142, pl. 12, fig. 8 (*non Nerinea credneri* Müller 1900 (*non* Zittel), = *Nerinella muelleri* Cox).

SPECIFIC NAME. After the late W. E. Cutler, the first leader of the British Museum East African Expedition.

DIAGNOSIS. Shell very slender, up to about 13 cm. in length ; whorls feebly concave to almost flat, their height approximately equal to their diameter ; earlier whorls ornamented with very obscurely granose spiral threads, the number of which increases to about nine at a diameter of about 5 mm. ; later whorls almost smooth. One prominent fold low on the columella ; one prominent parietal fold occupying the angle between the columella and the upper wall of the whorl ; one broad-based fold, which usually is more or less quadrate in cross-section with two well-marked inner angles, but is not definitely bifid, just below the middle of the outer wall ; and (in some specimens only) a very weak fold on the basal wall.

HOLOTYPE AND PARATYPES. Holotype, no. G.46026, a broken specimen selected because it retains its surface ornament. Numerous paratypes, the majority eroded.

LOCALITIES AND HORIZON. Several localities in Tendaguru neighbourhood (Kipande path (type-locality), N. of Kipande, 1 mile N.W. of Tendaguru hill, scarp at Kindope, Namapuya creek) and Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru ; Upper Kimmeridgian, *Nerinella* Bed. Lilomba creek and ¾ mile S. of Nautope, near Tendaguru ; Upper Kimmeridgian, " *Trigonia smeei* " Bed. Hillside 3 miles E. of Rahmu, south of the road to Mandera, N.E. Kenya ; Upper Oxfordian, Seir Limestones.

REMARKS. The common Tendaguru *Nerinella* has hitherto been identified as *N. credneri* (Müller), a species more correctly known as *N. muelleri* Cox and recorded above. This latter species has been accepted as a long-ranging one both by Dietrich (1914 : 142) and by Hennig (1924 : 51), but this conclusion seems to need critical re-examination. For interpretation of *N. muelleri* I have to rely mainly on Müller's description and figures. Externally, this species is very close to the Tendaguru form both as regards whorl outline and ornament, the nodose threads which are present on the earlier whorls disappearing at a later growth-stage, leaving the surface almost smooth. Müller's fig. 12 indicates that the spiral threads ornamenting the whorls of *N. muelleri* bear more conspicuous granules than have been observed in Tendaguru specimens, but the granules may have been exaggerated by the artist. A more noticeable difference lies in the shape of the labral fold, which Müller's fig. 13 shows to be relatively slender where it joins the outer lip and to split up distally into two branches of appreciable length. In Tendaguru specimens the corresponding fold is broad at its base and its outline is either triangular or square, at times with slightly projecting angles. This difference, considered in conjunction with the much higher stratigraphical horizon, seems to justify the recognition of the Tendaguru *Nerinella* as a species distinct from *N. muelleri.* Of European species, *N. danusensis* (d'Orbigny) (1852 : 118, pl. 267, figs. 4–6) has a labral fold rather similar in cross-section to that of the Tendaguru species, but its whorls are more strongly concave and more coarsely ornamented.

The specimens from the Seir Limestones of N.E. Kenya consist of partly weathered-out shells on the surface of a bed of hard limestone. Their surface features are not preserved, but erosion has exposed the internal structure of some of the shells, which include specimens with folds agreeing well with those of *N. cutleri*, particularly as regards the shape of the one on the outer lip. Other genera are also represented.

Nerinella mandawaensis sp. nov.

Pl. 30, figs. 1, 2*a*, *b*, 3

Diagnosis. Shell very slender, the largest specimens having a maximum diameter of 6·5 mm. and an estimated length, when complete, of about 10 cm. Whorls moderately concave, with the sutural region forming a swollen band ; height of whorls slightly exceeding their diameter. Ornament consisting of granose spiral threads ; some specimens with four primary ones throughout, with weak interstitials, other specimens with up to eight threads on later whorls, where they differ very little in strength but are distributed irregularly. One not very prominent internal fold on the lower part of the columella ; one narrow, thorn-like parietal fold occupying the angle between the columella and the upper wall of the whorl ; and one prominent but only moderately broad fold, widening slightly at its distal end in some specimens, just below the middle of the outer wall.

Holotype and paratypes. Nos. GG.10333, GG.10334–38 respectively, the paratypes in pieces of sandstone some containing several specimens.

Locality and horizon. Along Mandawa–Namakongoro stream, about 1 mile W. of Mandawa, Tanganyika ; Middle–Upper Kimmeridgian.

Remarks. The specimens are of the same age as *Nerinella cutleri*, from Tendaguru, but their recognition as a distinct species is justified by their more strongly concave whorls and by the differences in their internal folds. The labral fold, in particular, is narrower but more prominent than that of the Tendaguru form.

Genus *PSEUDONERINEA* de Loriol 1890

Pseudonerinea clio (d'Orbigny)

Pl. 30, figs. 5, 6

1850*b*. *Chemnitzia Clio* d'Orbigny : 2.
1851. *Chemnitzia Clio* d'Orbigny : 66, pl. 249, figs. 2, 3.
1861. *Chemnitzia Clio* d'Orb. ; Thurmann & Étallon : 87, pl. 6, fig. 26.
1867*a*. *Pseudomelania Clio* (d'Orbigny) ; de Loriol : 14, pl. B, fig. 1.
1887. *Pseudomelania Clio* (d'Orbigny) ; de Loriol : 139, pl. 14, figs. 5, 6.
1894*a*. *Pseudonerinea Clio* (d'Orbigny) ; de Loriol : 42, pl. 3, figs. 5, 6.
1898. *Pseudonerinea Clio* (d'Orbigny) ; Cossmann : 10, pl. 1, figs. 11, 12, 16.
1911. *Pseudomelania* aff. *Clio* (d'Orbigny) ; Blaschke : 166, pl. 4, fig. 6.

MATERIAL. Six specimens (including nos. GG.10329–31), mostly imperfect.

LOCALITY AND HORIZON. ¼ mile E. of Nangororo, Tanganyika ; Upper Kimmeridgian.

REMARKS. The largest of the specimens now recorded is about 57 mm. high. The specimens agree quite well with European ones in the general form of the shell and the relative height of the almost flat whorls. In one specimen the anterior outlet of the aperture, which undercuts the columella, is well seen, but its canal-like appearance is intensified by the fact that the basal lip is broken away. In the figures of *P. clio* published by d'Orbigny and by Thurmann & Étallon the anterior margin of the aperture is restored, incorrectly, as entire and evenly rounded. Cossmann describes the aperture of *P. clio* as " largement sinueuse à la base " and the columella as " se terminant en pointe un peu infléchie contre la sinuosité antérieure de l'ouverture, sans former de bec avec le contour supérieur [i.e. the basal margin]. " De Loriol (1894*a* : 42, pl. 3, fig. 5), however, figures a specimen with an anterior outlet very much like that of the form now described and comments upon it. Cossmann (1898 : 4) would refer species with a canal-like outlet to *Fibula* rather than to *Pseudonerinea*, but in typical species of *Fibula* the shell is much less slender than in forms such as that now recorded. One of the specimens has been sectioned and shown to be without internal folds, as in all species of *Fibula* and *Pseudonerinea*. In Europe this species occurs in coralline beds of the Kimmeridgian stage.

Genus *TROCHALIA* Sharpe 1850

Trochalia depressa (Voltz)

Pl. 29, fig. 7

1835. *Nerinea depressa* Voltz : 425.
1836. *Nerinea depressa* Voltz ; Bronn : 549, pl. 6, figs. 17*a*, *b*.
1850. *Trochalia depressa* (Voltz) ; Sharpe : 107.
1851. *Nerinea depressa* Voltz ; d'Orbigny : 104, pl. 259 (as *N. umbilicata*).
1861. *Nerinea depressa* Voltz ; Thurmann & Étallon : 97, pl. 8, fig. 42.
1869. *Cryptoplocus depressus* (Voltz) ; Gemmellaro : 42, pl. 6, figs. 9–11.
1869. *Cryptoplocus umbilicatus* (d'Orb.) ; Gemmellaro : 43, pl. 2 *bis*, figs. 18, 19.
1874. *Trochalia depressa* (Voltz) ; de Loriol : 312, pl. 7, fig. 2.
1886. *Trochalia depressa* (Voltz) ; de Loriol : 115, pl. 11, figs. 10, 11.
1898. *Cryptoplocus depressus* (Voltz) ; Cossmann : 158, pl. 11, figs. 33, 34 : pl. 12, figs. 3, 4, 7, 11, 12.

MATERIAL. Several specimens (nos. G.70517–18, G.76375–76, G.76389) preserved in hard limestone.

LOCALITIES AND HORIZON. Melka Dakacha, 1 mile W. of Melka Dakacha, and 1 mile S.S.W. of Melka Dakacha, N.E. Kenya ; Upper Kimmeridgian, Dakacha Limestones.

REMARKS. These specimens agree well with European ones in the angle of their spire and in their very feebly convex, non-gradate whorls. The largest one was 15 cm. or more high when complete. Axial sections show the broad umbilicus and a single, very strong internal fold, projecting from the upper wall of the whorls. In Europe this species ranges from the Lower Kimmeridgian to the Upper Kimmeridgian and probably higher.

Order TECTIBRANCHA Cuvier

Superfamily **BULLACEA**

Family **ACTEONIDAE** d'Orbigny 1842

Genus ***ACTEONINA*** d'Orbigny 1850

Subgenus ***STRIACTAEONINA*** Cossmann 1895

Acteonina* (*Striactaeonina*) *supraliasica sp. nov.

Pl. 29, figs. 4*a*, *b*, *c*

DIAGNOSIS. Of medium size for the subgenus (height of largest specimen c. 15 mm.), with a relatively high and narrow, cylindrical last whorl and an acute, gradate-conical spire, the height of which is about one-quarter of that of the shell. Whorls with a steep, flattened ramp which forms an angle of about 60° with the horizontal and a subvertical outer face, of which only a narrow strip is exposed on the spire. The outline of the last whorl is broadly convex where it merges abapically into the steeply sloping base. Outer face and base ornamented with unevenly spaced, linear spiral grooves. Aperture very narrow adapically ; outer lip not preserved intact ; inner lip simple, with a thin, narrowly spread, distinctly margined coating of callus.

HOLOTYPE AND PARATYPES. Nos. GG.10271 and GG.10272–74 respectively, four specimens in all.

LOCALITY AND HORIZON. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya ; Upper Lias, Toarcian, Didimtu Beds.

REMARKS. The specimens are rather eroded and it is not possible to see if the spiral groove commonly found just below the ramp in species of *Striactaeonina* is present. The general form of the shell resembles that of some species of *Cylindrites*, but the presence of spiral ornament and the absence of folds low on the columellar lip distinguish it from that genus.

Family **AKERIDAE** Cossmann 1895

Genus ***AKERA*** Müller 1776

Akera tanganyicensis sp. nov.

Pl. 29, figs. 5*a*, *b*

Diagnosis. Of medium size (height of holotype 27·5 mm.), cylindrical, involute, with flattened spire ; maximum diameter about three-fifths of height in holotype (in which specimen, however, it is probably increased a little by crushing). Sutures impressed. Sides of last whorl very feebly convex and diverging slightly in an abapical direction as far as the periphery of the base, which lies at about the lower third of the height of the shell, and below which the outline of the base is very feebly convex. Aperture of moderate breadth above, where the inner lip is formed by the steep face of the previous whorl, broadening below, where the inner lip recedes to the columella. Outer lip vertical, curving back to a slight extent at its upper end, to meet the suture ; basal margin of aperture forming an even curve ; columellar lip vertical, short.

Holotype. No. GG.10332. The only specimen.

Locality and horizon. Along Mbaru stream, 1 mile N.W. of Mbinga, Tanganyika ; Callovian.

Remarks. This form seems to be congeneric with a series of Jurassic species which Cossmann (1896*b* : 127–131) includes in *Acera* [better, *Akera*], a genus originally founded on Recent forms. In *A. mediojurensis* Cossmann (1896*b* : 128, pl. 6, figs. 8, 9), from the Callovian and Lower Oxfordian of France, the side of the last whorl is more strongly convex and the shell is slightly broader in proportion to its height than in the species now described. In *A. truncata* (Lennier), from the Kimmeridgian of France, the shell, as figured by Cossmann (1896*b* : 130, pl. 6, figs. 13, 14), is even closer to the present form in shape, but is slightly more slender.

V LIST OF FOSSIL LOCALITIES, WITH SPECIES COLLECTED AT EACH

Localities in S.E. Tanganyika

Tendaguru : Tingutitinguti creek, S.W. of Tendaguru hill ; Upper Kimmeridgian, "*Trigonia smeei*" *Bed*.

Cucullaea sp., *Modiolus bipartitus* (J. Sowerby), *Mytilus* (*Falcimytilus*) *dietrichi* sp. nov., *Lithophaga suboblonga* Dietrich, *Gervillella aviculoides* (J. Sowerby), *Meleagrinella radiata* (Trautschold), *Lima* (*Plagiostoma*) sp., *Lima* (*Acesta*) *cutleri* sp. nov., *Liostrea dubiensis* (Contejean), *Trigonia* (*Indotrigonia*) *smeei* auct., *Hippopodium quenstedti* (Dietrich), *Astarte* sp., *Opis* sp., *Lucina* sp., *Mactromya* sp., *Protocardia schencki* Müller, *Protocardia* (*Tendagurium*) *propebanneiana* (Dietrich), *Eomiodon* (*Africomiodon*) *cutleri* sp. nov., *Symmetrocapulus* ? sp., *Pseudomelania* (*Oonia*) *dietrichi* sp. nov., *Ampullospira* ? sp., *Globularia* sp.

Tendaguru : Maimbwi river, S.E. of Tendaguru. Upper Kimmeridgian, "*Trigonia smeei*" Bed.

Meleagrinella radiata (Trautschold), *Trigonia* (*Indotrigonia*) *smeei* auct., *Astarte weissermeli* Dietrich, *Astarte subobovata* Dietrich, *Cossmannea hennigi* (Dietrich).

Tendaguru : near summit of Tendaguru hill. Upper Kimmeridgian, "*Trigonia smeei*" Bed.

Meleagrinella radiata (Trautschold).

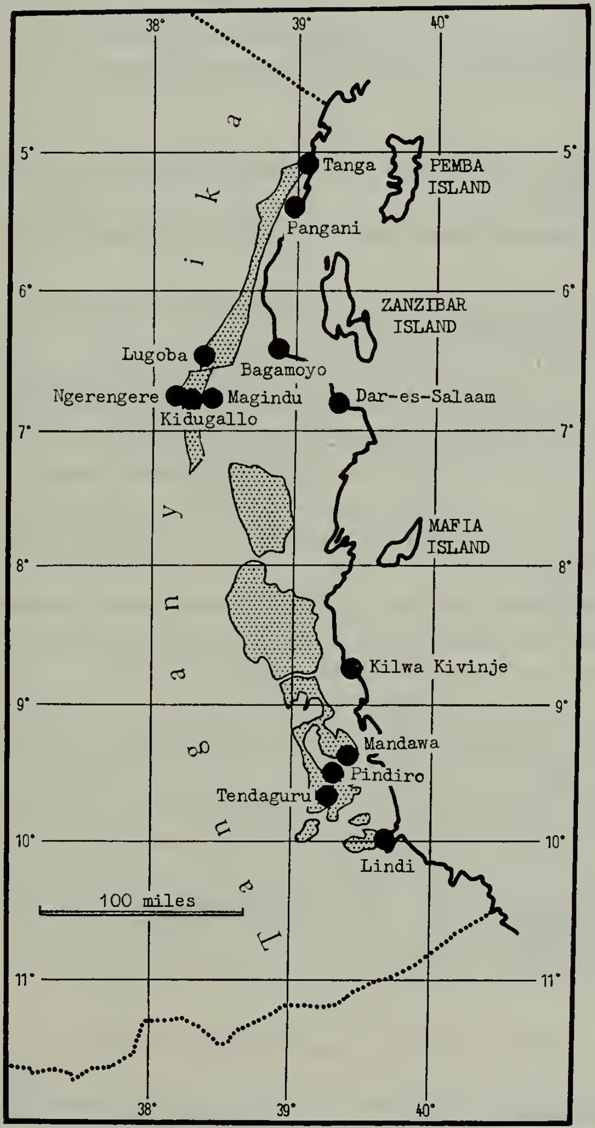

FIG. 1. Sketch-map of eastern Tanganyika, showing Jurassic outcrops.

Tendaguru : excavation " M 1 ", Tendaguru hill. Upper Kimmeridgian, Dinosaur Bed.
Eomiodon dinosaurianum sp. nov.

Tendaguru : excavation " M 7 ". Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Mytilus (*Falcimytilus*) *dietrichi* sp. nov., *Astarte* sp.

Tendaguru : valley N.N.W. of " D " flag, ¾ mile N. of Tendaguru hill, on road to Kindope. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Meleagrinella radiata (Trautschold), *Trigonia* (*Indotrigonia*) *smeei* auct., *Hippopodium quenstedti* (Dietrich).

Tendaguru : Dwanika river, N.E. of Tendaguru hill. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Trigonia (*Indotrigonia*) *smeei* auct., *Laevitrigonia dwanikana* sp. nov.

Tendaguru : beyond the N.W. flag, 1 mile N.W. of Tendaguru hill. Upper Kimmeridgian, *Nerinella* Bed.
Grammatodon (*Indogrammatodon*) *irritans* (Hennig), *Cucullaea* sp., *Gervillella aviculoides* (J. Sowerby), *Stegoconcha gmuelleri* (Krenkel), *Trigonia migeodi* sp. nov., *Trigonia* (*Indotrigonia*) *smeei* auct., *Hippopodium quenstedti* (Dietrich), *Astarte recki* Dietrich, *Astarte sowerbyana* Holdhaus, *Nerinella cutleri* sp. nov.

Tendaguru : 2000 ft. N. of Kipande N. flag, W. of Tendaguru hill. Upper Kimmeridgian, *Nerinella* Bed.
Stegoconcha gmuelleri (Krenkel), *Trigonia* (*Indotrigonia*) *smeei* auct., *Astarte recki* Dietrich, *Astarte* sp., *Astarte sowerbyana* Holdhaus, *Sphaera subcorrugata* Dietrich, *Homomya hortulana* Agassiz, *Nerinella cutleri* sp. nov.

Tendaguru : 4th Kipande flag, W. of Tendaguru hill. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Cucullaea kipandeensis sp. nov., *Grammatodon* (*Indogrammatodon*) *irritans* (Hennig), *Astarte recki* Dietrich, *Eomiodon* (*Africomiodon*) *cutleri* sp. nov.

Tendaguru : Kipande creek, W. of Tendaguru hill. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Lithophaga suboblonga Dietrich.

Tendaguru : Kipande path, W. of Tendaguru hill. Upper Kimmeridgian, *Nerinella* Bed.
Cucullaea kipandeensis sp. nov., *Stegoconcha gmuelleri* (Krenkel), *Chlamys* (*Radulopecten* ?) sp., *Lissochilus stremmei* Dietrich, *Nerinella cutleri* sp. nov.

Tendaguru : between first and N. flags, Kipande path, W. of Tendaguru hill. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Lopha hennigi (Dietrich), *Trigonia* (*Indotrigonia*) *smeei* auct., " *Pleurotomaria* " sp.

Tendaguru : 200 yards N.E. of workings at Nguruwe, 1½ miles S. of Tendaguru hill. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Lithophaga suboblonga Dietrich, *Trigonia* (*Indotrigonia*) *smeei* auct.

Tendaguru : Mtapaia road, N. of Tendaguru. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Lopha hennigi (Dietrich), *Homomya hortulana* Agassiz.

Tendaguru : " ditch 2x ", Tapaira trail, S. of Tendaguru. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Meleagrinella radiata (Trautschold), *Liostrea* sp., *Astarte* sp., *Chrysostoma staffi* Dietrich.

Tendaguru : road 1½ miles N.N.W. of Tapaira village, S.W. of Tendaguru. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Hippopodium quenstedti (Dietrich).

Tendaguru : 3 miles N.N.W. of Tapaira village, S.W. of Tendaguru. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Cucullaea sp., *Chlamys* sp., *Trigonia* (*Indotrigonia*) *smeei* auct., *Sphaera subcorrugata* Dietrich.

Tendaguru : Namapuya creek. Upper Kimmeridgian, *Nerinella* Bed.
Nerinella cutleri sp. nov.

Tendaguru : Nitongola creek. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Meleagrinella radiata (Trautschold), *Lima* (*Plagiostoma*) sp., *Lima* (*Acesta*) *cutleri* sp. nov., *Trigonia* (*Indotrigonia*) *smeei* auct., *Astarte weissermeli* Dietrich, *Coelastarte dietrichi* sp. nov., *Protocardia schencki* Müller, " *Patella* " sp.

Tendaguru : Lilomba creek. Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Cucullaea sp., *Mytilus* (*Falcimytilus*) *dietrichi* sp. nov., *Lithophaga suboblonga* Dietrich, *Chlamys* sp., *Chlamys* (*Radulopecten*) *kinjeleensis* sp. nov., *Liostrea* sp., *Trigonia* (*Indotrigonia*) *smeei* auct., *Astarte* sp., *Lucina cutleri* sp. nov., *Nerinella cutleri* sp. nov.

Kindope, N.N.W. of Tendaguru ; " Kindope river ". Upper Kimmeridgian, " *Trigonia smeei* " Bed.
Grammatodon (*Indogrammatodon*) *irritans* (Hennig), *Mytilus* (*Falcimytilus*) *dietrichi* sp. nov., *Pinna constantini* de Loriol, *Meleagrinella radiata* (Trautschold),

Entolium corneolum (Young & Bird), *Chlamys* sp., *Lima* (*Acesta*) *cutleri* sp. nov., *Lima* (*Plagiostoma*) sp., *Liostrea dubiensis* (Contejean), *Trigonia* (*Indotrigonia*) *dietrichi* Lange, *Astarte weissermeli* Dietrich, *Lucina* sp., *Protocardia schencki* Müller, *Scurriopsis* (*Dietrichiella*) *kindopensis* (Dietrich), *Lissochilus stremmei* Dietrich.

Kindope, N.N.W. of Tendaguru ; about 100 feet down scarp. Upper Kimmeridgian, *Nerinella* Bed.

Eonavicula sp. " B ", *Modiolus* sp., *Musculus kindopeensis* sp. nov., *Pseudolimea duplicata* (J.de C. Sowerby), *Limatula migeodi* sp. nov., *Protocardia schencki* Müller.

Kindope, N.N.W. of Tendaguru ; 30 to 70 feet down scarp. Upper Kimmeridgian, *Nerinella* Bed.

Grammatodon (*Indogrammatodon*) *irritans* (Hennig), *Lithophaga* sp., *Pinna constantini* de Loriol, *Liostrea dubiensis* (Contejean), *Astarte* sp.

Kindope, N.N.W. of Tendaguru ; bottom of scarp. Upper Kimmeridgian, *Nerinella* Bed.

Stegoconcha gmuelleri (Krenkel).

Kindope, N.N.W. of Tendaguru ; three-quarters of way down scarp. Upper Kimmeridgian, *Nerinella* Bed.

Grammatodon (*Indogrammatodon*) *irritans* (Hennig), *Apolinter kindopeensis* sp. nov., *Musculus kindopeensis* sp. nov., *Gervillella aviculoides* (J. Sowerby), *Pinna constantini* de Loriol, *Trichites* sp., *Meleagrinella radiata* (Trautschold), *Entolium corneolum* (Young & Bird), *Chlamys* sp., *Lima* (*Acesta*) *kindopeensis* sp. nov., *Pseudolimea duplicata* (J. de. C. Sowerby), *Liostrea dubiensis* (Contejean), *Trigonia* (*Indotrigonia*) *smeei* auct., *Protocardia schencki* Müller, *Eomiodon* (*Africomiodon*) *cutleri* sp. nov., *Nerinella cutleri* sp. nov.

Kindope, N.N.W. of Tendaguru ; top of scarp. Upper Kimmeridgian, *Nerinella* Bed.

Lopha hennigi (Dietrich).

Kindope, N.N.W. of Tendaguru ; Kindope river, 150 feet below " St." Upper Kimmeridgian, *Nerinella* Bed.

Grammatodon (*Indogrammatodon*) *irritans* (Hennig), *Gervillella aviculoides* (J. Sowerby), *Pinna constantini* de Loriol, *Oxytoma inequivalvis* (J. Sowerby), *Meleagrinella radiata* (Trautschold), *Bositra somaliensis* (Cox), *Exogyra nana* (J. Sowerby), *Protocardia schencki* Müller, *Anisocardia kinjeleensis* sp. nov.

Kindope, N.N.W. of Tendaguru. Upper Kimmeridgian, " *Trigonia smeei* " Bed.

Meleagrinella radiata (Trautschold), *Placunopsis* sp., *Trigonia* (*Indotrigonia*) *smeei* auct.

Kindope, N.N.W. of Tendaguru. Upper Kimmeridgian, *Nerinella* Bed.
Lithophaga sp., *Lopha? kindopeensis* sp, nov.

Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru. Upper Kimmeridgian, "*Trigonia smeei*" Bed.
Mytilus (*Falcimytilus*) *dietrichi* sp. nov., *Trigonia* (*Indotrigonia*) *smeei* auct.

Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru. Upper Kimmeridgian, *Indogrammatodon* Bed.
Grammatodon (*Indogrammatodon*) *irritans* (Hennig), *Modiolus* (*Inoperna*) *perplicatus* (Étallon), *Meleagrinella radiata* (Trautschold), *Entolium corneolum* (Young & Bird), *Liostrea* sp., *Protocardia schencki* Müller, *Anisocardia kinjeleensis* sp. nov., *Pleuromya uniformis* (J. Sowerby).

N. of Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru. Upper Kimmeridgian, "*Trigonia smeei*" Bed.
Trigonia (*Indotrigonia*) *smeei* auct.

N. of Kinjele, 5 miles W. of Mtapaia, N. of Tendaguru. Upper Kimmeridgian, *Nerinella* Bed.
Chlamys (*Radulopecten*) *kinjeleensis* sp. nov., *Lopha* ? *kindopeensis* sp. nov., *Nerinella cutleri* sp. nov.

¾ mile S. of Nautope, 14 miles N.N.W. of Mtapaia. Upper Kimmeridgian, "*Trigonia smeei*" Bed.
Trigonia (*Indotrigonia*) *smeei* auct., *Astarte weissermeli* Dietrich, *Nerinella cutleri* sp. nov.

Pindiro well no. 1, depths 162 to 254 feet (B.P.). 9° 30′ 15″ S., 39° 18′ 37″ E. Bajocian (?), Pindiro Shales.
Corbula pindiroensis sp. nov.

Mandawa well no. 6, depths 38 to 72 feet (B.P.). 9° 25′ 4″ S., 39° 25′ 9″ E., Bajocian (?).
Gervillella orientalis (Douvillé), 50–52 feet, *Pronoella putealis* sp. nov., 46–64 feet, *Corbula mandawaensis* sp. nov., 46–72 feet, *Coelostylina mandawaensis* sp. nov., 58–68 feet, *Zygopleura mandawaensis* sp. nov., 58–66 feet, *Procerithium* (*Rhabdocolpus*) *mandawaense* sp. nov., 38–70 feet, *Exelissa africana* sp. nov., 50–72 feet, *Brachytrema* sp., 46–54 feet, *Pietteia stockleyi* sp. nov., 46–62 feet.

Mandawa well no. 7, depths 92–4520 feet (B.P.). 9° 24′ 58″ S., 39° 25′ 3″ E. Bajocian (?).
Corbula tanganyicensis sp. nov., 3760–4520 feet, *Procerithium* (*Rhabdocolpus*) *mandawaense* sp. nov., 92–100 feet.

Lonji creek, W. of Mandawa (B.P. loc. DMM 176). 9° 21′ 40″ S., 39° 24′ 22″ E. Callovian (?).

Grammatodon (*Indogrammatodon*) *virgatus* (J. de C. Sowerby), *Astarte unilateralis* J. de C. Sowerby.

Lonji creek, W. of Mandawa (B.P. loc. DMM 177). 9° 21′ 47″ S., 39° 24′ 25″ E. Callovian.

Thracia viceliacensis d'Orbigny.

Lonji creek, W. of Mandawa, (B.P. loc. DMM 182). 9° 22′ 15″ S., 39° 23′ 11″ E. Upper Kimmeridgian.

Fimbria sp. " C ".

Left bank tributary, Lonji creek, W. of Mandawa (B.P. loc. DMM 183). 9° 22′ 15″ S., 39° 23′ 11″ E. Upper Kimmeridgian.

Astarte lonjiensis sp. nov.

Lonji creek, W. of Mandawa (B.P. loc. DMM 184). 9° 22′ 16″ S., 39° 23′ 12″ E. Upper Kimmeridgian.

Astarte mandawaensis sp. nov.

Mandawa–Lonji creek traverse, Mandawa area (B.P. loc. DMM 189). 9° 21′ 58″ S., 39° 25′ 36″ E. Lower Kimmeridgian.

Paracerithium lonjiense sp. nov.

" Station 76 " (about 1½ miles W. of Mandawa), Mandawa–Lonji creek traverse. (B.P. loc. DMM 196). 9° 22′ 0″ S., 39° 25′ 20″ E. Callovian (?).

Trigonia elongata J. de C. Sowerby.

Mandawa–Lonji creek traverse, Mandawa area (B.P. loc. DMM 197). 9° 21′ 57″ S., 39° 25′ 24″ E. Upper Oxfordian.

Eopecten aubryi (Douvillé), *Pholadomya hemicardia* Roemer, *Pleuromya calceiformis* (Phillips).

Lihimaliao creek, Mandawa area (B.P. loc. DMM 211). 9° 25′ 13″ S., 39° 24′ 28″ E. Upper Oxfordian.

Pseudolimea mandawaensis sp. nov., *Liostrea polymorpha* (Münster), *Astarte sowerbyana* Holdhaus.

Lihimaliao creek, near Mbaru creek, Mandawa area (B.P. loc. DMM 214). 9° 25′ 30″ S., 39° 26′ E. Bajocian (?), Pindiro Shales.

Parallelodon pindiroensis sp. nov., *Modiolus imbricatus* (J. Sowerby), *Gervillella orientalis* (Douvillé), *Protocardia bipi* sp. nov., *Protocardia besairiei* sp. nov., *Pronoella pindiroensis* sp. nov., *Pronoella putealis* sp. nov., *Ceratomya tanganyicensis* sp. nov., *Thracia lens* (Agassiz), *Coelostylina mandawaensis* sp. nov., *Ampullospira besairiei* sp. nov.

Scarp stream on west-facing scarp immediately N. of Matapwa, 20 yards above second and bigger waterfall and 550 yards W. of road, Pindiro area (B.P. loc. RS 569). 9° 39′ 25″ S., 39° 24′ 34″ E. Upper Kimmeridgian.

Grammatodon (*Indogrammatodon*) *matapwaensis* sp. nov., *Brachidontes* (*Arcomytilus*) *laitmairensis* (de Loriol), *Chlamys matapwaensis* sp. nov., *Protocardia suprajurensis* (Contejean).

Hillside overlooking Lake Mbuo, Pindiro–Ruwawa valley (B.P. loc. RS. 695). 9° 28′ 56″ S., 39° 19′ 0″ E. Middle Kimmeridgian.

Entolium corneolum (Young & Bird).

Mpilepile stream, 800 yards E.N.E. of Mitole road junction, northern Mandawa area (B.P. loc. RS 814). 9° 16′ 13″ S., 39° 23′ 48″ E. Upper Kimmeridgian.

Opisthotrigonia curta (Aitken), *Astarte weissermeli* Dietrich, *Seebachia janenschi* Dietrich.

Mpilepile stream, below 2nd confluence on N. side, 1300 yards E.N.E. of Mitole road junction, northern Mandawa area (B.P. loc. RS 815). 9° 16′ 3″ S., 39° 24′ 1″ E. Upper Kimmeridgian.

Astarte mitoleensis sp. nov.

Mpilepile stream bed, running E. from Mitole, 200 yards S.E. of a point 1300 yards E.N.E. of Mitole road junction, northern Mandawa area (B.P. loc. RS 816). 9° 15′ 56″ S., 39° 24′ 23″ E. Upper Kimmeridgian.

Chlamys (*Radulopecten*?) *kinjeleensis* sp. nov.

Mpilepile stream bed, running E. from Mitole, just below confluence on S. side, 1650 yards N.E. of Mitole road junction, northern Mandawa area (B.P. loc. RS 817). 9° 15′ 56″ S., 39° 24′ 32″ E. Upper Kimmeridgian.

Nummocalcar mitoleensis sp. nov.

Kiwawa stream, 2400 yards S.E. of Mitekera survey beacon, northern Mandawa area (B.P. loc. RS 838). 9° 14′ 44″ S., 39° 19′ 36″ E. Upper Kimmeridgian.

Chlamys (*Radulopecten*?) *kinjeleensis* sp. nov., *Myophorella kiwawaensis* sp. nov.

Near site of Mandawa well no. 1 (B.P. loc. PEK 5798). 9° 18′ 43″ S., 39° 22′ 35″ E. Bajocian (?), Pindiro Shales.

Gervillella orientalis (Douvillé), *Pinna buchii* Koch & Dunker, *Astarte kenti* sp. nov., *Mactromya eamesi* sp. nov., *Pronoella pindiroensis* sp. nov., *Coelostylina mandawaensis* sp. nov., *Pictavia tanganyicensis* sp. nov., *Ampullospira besairiei* sp. nov., *Zygopleura mandawaensis* sp. nov., *Exelissa africana* sp. nov., *Pietteia* sp., *Acteonina* sp.

About 1 mile E.S.E. of Uleka, Mavudyi–Namgaru area (B.P. loc. JOZ 189). 9° 51′ 33″ S., 39° 27′ 30″ E. "Jurassic", stage uncertain.

Eomiodon namgaruensis sp. nov.

N. bank of Mandawa–Namakongoro stream, between telegraph line and Lindi–Kilwa road, about 1 mile W. of Mandawa (loc. WA 794). 9° 22′ 24″ S., 39° 26′ 9″ E. M.–U. Kimmeridgian.
Bathrotomaria aitkeni sp. nov.

N. bank of Mandawa–Namakongoro stream, about 1 mile W. of Mandawa (loc. WA 812, WA 2001). 9° 22′ 24″ S., 39° 26′ 6″ E. M.–U. Kimmeridgian.
Pseudomelania (*Oonia*) *aitkeni* sp. nov., *Nerinella mandawaensis* sp. nov.

Along Mandawa–Namakongoro stream, about 200 yards above confluence with Mandawa stream (loc. WA 817). 9° 22′ 28″ S., 39° 26′ 4″ E. M.–U. Kimmeridgian.
Bathrotomaria aitkeni sp. nov.

Along Mandawa–Namakongoro stream, about ½ mile above confluence with Mandawa stream (loc. WA 823). 9° 22′ 40″ S., 39° 26′ 2″ E. M.–U. Kimmeridgian.
Bathrotomaria aitkeni sp. nov.

About 1 mile N. of Manyuli, near Lindi–Kilwa road (loc. WA 944). 9° 17′ 58″ S., 39° 24′ 6″ E. M.–U. Kimmeridgian.
Pseudomelania vittata (Phillips).

1½ miles N.W. of Mandawa (loc. WA 971). 9° 21′ 34″ S., 39° 26′ 3″ E., M.–U. Kimmeridgian.
Lissochilus stremmei Dietrich.

½ mile up Nchia stream, 2 miles W.N.W. of Mandawa (loc. WA 1005, 1180). 9° 21′ 36″ S., 39° 25′ 10″ E. Callovian.
Astarte aitkeni sp. nov., *Pseudomelania aspasia* (d'Orbigny), *Bourguetia saemanni* (Oppel), *Ampullospira quennelli* sp. nov., Nerineidae, gen. et sp. indet.

¾ mile N.W. of Mbinga (loc. WA 1156). 9° 25′ 43″ S., 39° 26′ 39″ E. Upper Kimmeridgian.
Purpuroidea aff. *gigas* (Thurmann & Étallon).

Along Lonji–Runjo stream at a point 1½ miles W. of Mandawa (loc. WA 1220). 9° 22′ 2″ S., 39° 25′ 21″ E. Callovian.
Pseudorhytidopilus lonjiensis sp. nov.

Along Lonji stream, a little E.N.E. of Nandenga hill (loc. WA 1287). 9° 21′ 44″ S., 39° 24′ 25″ E. Bathonian–Upper Oxfordian part of Mandawa–Mahokondo Series ; probably Callovian.
Globularia sp.

Along Lonji stream, a little E.N.E. of Nandenga hill (loc. WA 1345). 9° 21′ 46″ S., 39° 24′ 29″ E. Callovian.
Pseudomelania aff. *aspasia* (d'Orbigny), *Ampullospira quennelli* sp. nov.

Along Lonji stream, a little E.N.E. of Nandenga hill (loc. WA 1346). 9° 21′ 48″ S., 39° 24′ 26″ E. Callovian.
Ampullospira quennelli sp. nov.

Along Mbaru stream, 1 mile N.W. of Mbinga (loc. WA 1634). 9° 25′ 36″ S., 39° 26′ 16″ E. Callovian.
Harpagodes aff. *oceani* (Brongniart), *Akera tanganyicensis* sp. nov.

Mpilipili stream at a point about 1 mile N.E. of Mitole (loc. WA 1691). 9° 15′ 40″ S., 39° 24′ 38″ E. Upper Kimmeridgian.
Chartronella mitoleensis sp. nov.

Along Lihimaliao stream at a point about ¾ mile E. of Njenja (loc. WA 1817). 9° 25′ 17″ S., 39° 24′ 26″ E. Upper Oxfordian (?). (A nearby locality was dated as Upper Oxfordian on ammonite evidence.)
Grammatodon (*Indogrammatodon*) *virgatus* (J. de C. Sowerby). *Nerinella* ? *muelleri* Cox.

Along Nchia stream, ½ mile E. of Lonji (loc. WA 2013). 9° 21′ 25″ S., 39° 24′ 45″ E. Bathonian–Upper Oxfordian part of Mandawa–Mahokondo Series ; probably Callovian.
Globularia sp.

½ mile S. of Madaraha (loc. WA 2158). 9° 20′ 54″ S., 39° 23′ 24″ E. Middle–Upper Kimmeridgian.
" *Pleurotomaria* " sp.

Manyuli stream at a point just W. of Nautope, Mandawa–Mahokondo anticline (loc. WA 2162). 9° 17′ 40″ S., 39° 23′ 35″ E. Callovian.
Eopecten aubryi (Douvillé), *Entolium corneolum* (Young & Bird), *Harpagodes* aff. *oceani* (Brongniart).

Along Nunga stream, a short distance upstream from confluence with Manyuli stream, ¾ mile N.W. of Nautope (loc. WA 2258). 9° 17′ 23″ S., 39° 23′ 11″ E. Bathonian–Upper Oxfordian part of Mandawa–Mahokondo Series ; probably Callovian.
Harpagodes aff. *oceani* (Brongniart).

About 1 mile E. of Manyuli (loc. WA 2261). 9° 19′ 10″ S., 39° 26′ 10″ E. Upper Kimmeridgian.
" *Pleurotomaria* " sp.

E. of Bwatabwata village, Pindiro area (loc. WA 2273). 9° 29′ 48″ S., 39° 17′ 47″ E. (Aitken 1961 : 17). Bajocian (?), Pindiro Shales.
Protocardia sp.

Along Namakumbira stream, ¼ mile E. of Madaraha (loc. WA 2296). 9° 20′ 26″ S., 39° 23′ 52″ E. Bathonian–Upper Oxfordian part of Mandawa–Mahokondo Series.
Amphitrochus ? sp.

Along Namakumbira stream, ½ mile N. of Madaraha (loc. WA 2298). 9° 20′ 18″ S., 39° 23′ 45″ E. Bathonian–Upper Oxfordian part of Mandawa–Mahokondo Series.
" *Pleurotomaria* " sp.

¼ mile E. of Nangororo (loc. WA 2305). 9° 31′ 10″ S., 39° 19′ 51″ E. Upper Kimmeridgian.
Pseudonerinea clio (d'Orbigny), *Globularia* aff. *phasianelloides* (d'Orbigny).

Namakambe stream, Mandawa–Mahokondo anticline (loc. WA 2307). 9° 23′ 32″ S., 39° 24′ 40″ E. Probably Callovian.
Chlamys (*Spondylopecten*?) *badiensis* Cox.

Mbaru stream, N.E. of Nondwa and about ½ mile upstream from crossing of telegraph line, Mandawa–Mahokondo area (loc. WA 2349). 9° 25′ 16″ S., 39° 25′ 48″ E. Bajocian (?), Pindiro Shales.
Corbula ? sp., Procerithiidae.

Tributary of Namakumbira stream, 1 mile S.E. of Mkomore, Mandawa–Mahokondo area (locs. WA 2377, WA 2378). 9° 19′ 0″ S., 39° 23′ 28″ E. Bajocian (?), Pindiro Shales.
Astarte pindiroensis sp. nov., *Corbula* sp.

LOCALITIES IN THE HINTERLAND OF DAR ES SALAAM AND BAGAMOYO, TANGANYIKA

Quarries about 1 mile N.N.E. of Ngerengere, Central Railway. 6° 45′ S., 38° 8′ E. (Quennell *et al.*, 1956 : 126). Bajocian (?).
Mytilus? sp., *Bakevellia iraonensis* (Newton), *Eomiodon baroni* (Newton), *Eomiodon tanganyicensis* sp. nov., *Tancredia* sp.

1½ miles N.N.W. of Kidugallo, Central Railway (B.P. loc. JCS 108). 6° 46′ 15″ S., 38° 12′ 48″ E. Bajocian.
Trigonia kidugalloensis sp. nov., *Pronoella kidugalloensis* sp. nov.

2½ miles N.N.W. of Kidugallo, Central Railway (B.P. loc. JCS 124). 6° 45′ 35″ S., 38° 13′ 30″ E. Bajocian.
Pseudomelania (*Oonia*) *kidugalloensis* sp. nov., *Coelostylina stockleyi* sp. nov.

Magole, 5 miles N.W. of Kidugallo, Central Railway (B.P. loc. JCS 114, 115, 116, 117). 6° 44′ 22″ S., 38° 15′ 15″ E. Bajocian.

Trigonia costata Parkinson, *Eotrapezium*? *kenti* sp. nov., *Corbula kidugalloensis* sp. nov.

6 miles N.W. of Kidugallo, Central Railway (B.P. loc. JCS 120). 6° 44′ 35″ S., 38° 8′ 37″ E. Bajocian.
Eomiodon baroni (Newton), *Corbula eamesi* sp. nov.

6 miles N.W. of Kidugallo, Central Railway (B.P. loc. JCS 155). 6° 44′ 35″ S., 38° 8′ 10″ E. Bajocian.
Trigonia kenti sp. nov.

Kidugallo Station, Central Railway. 6° 47′ S., 38° 12′ 30″ E. (Quennell *et al.*, 1956 : 186). Bajocian, Station Beds.
Grammatodon sp., *Modiolus anatinus* Smith, *Pinna* sp., *Bositra buchi* (Roemer), *Entolium* sp., *Chlamys* sp., *Lima* (*Plagiostoma*) sp., *Lucina despecta* Phillips, *Mactromya* sp., *Pholadomya lirata* (J. Sowerby), *Osteomya dilata* (Phillips).

Rest house, Kidugallo, Central Railway. 6° 47′ S., 38° 12′ 30″ E. (Quennell *et al.*, 1956 : 186). Bajocian, Station Beds.
Grammatodon sp., *Parallelodon* sp., *Astarte* sp., *Mactromya* ? sp., *Protocardia* sp., *Eotrapezium* ? sp., *Tancredia* sp., *Ceratomya* sp., *Ataphrus* aff. *acmon* (d'Orbigny).

Borehole 5 miles N. of Kidugallo, Central Railway. 6° 43′ S., 38° 12′ E. (Arkell 1956 : 330). Lower Bajocian (Aalenian).
Bositra buchi (Roemer).

1¼ miles E. of Kidugallo Station, Central Railway (loc. M 47). 6° 47′ S., 38° 13′ E. Bajocian, Station Beds.
Modiolus anatinus Smith, *Chlamys* sp., *Lopha gregarea* (J. Sowerby), *Astarte* sp., *Lucina despecta* Phillips, *Fimbria kidugalloensis* sp. nov., *Protocardia* sp., *Pholadomya lirata* (J. Sowerby), *Goniomya trapezicostata* (Pusch), *Thracia* sp.

3 miles N.E. of Kidugallo Station, Central Railway (loc. M 46). 6° 46′ S., 38° 14′ E. Bajocian, Station Beds.
Lima (*Plagiostoma*) sp., *Globularia* sp.

2 miles W. of Magindu Station, Central Railway (loc. M 48). 6° 49′ S., 38° 17′ E. About Bathonian.
Liostrea dubiensis (Contejean).

1 mile W. of Magindu Station, Central Railway (loc. M 49). 6° 49′ S., 38° 18′ E. About Bathonian.
Liostrea dubiensis (Contejean).

Magindu, Central Railway (B.P. loc. PEK 5805). 6° 48′ 45″ S., 38° 19′ 7″ E. Callovian.
Liostrea (*Catinula*) *alimena* (d'Orbigny), *Ceratomya pittieri* (de Loriol).

E. of Magindu Station, Central Railway (loc. D 30), 6° 49′ S., 38° 20′ E. Callovian.
Liostrea sp.

About 2 km. E. of Magindu, Central Railway (B.P. loc. PEK 5806). 6° 49′ S., 38° 20′ 15″ E. Callovian.
Liostrea (*Catinula*) *alimena* (d'Orbigny).

2 miles E. of Magindu Station, Central Railway (loc. D 31). 6° 49′ S., 38° 22′ E. Callovian.
Ceratomyopsis basochiana (Defrance), *Pholadomya lirata* (J. Sowerby).

2 miles E. of Magindu Station, Central Railway (locs. D. 34, D 36). 6° 49′ S., 38° 21′ E. Callovian.
Trigonia (*Frenguelliella*) *tealei* Cox, *Astarte muelleri* Dacqué, *Pholadomya lirata* (J. Sowerby).

Changogo–Magindu track, 4 miles from Changogo town (B.P. loc. PEK 5801). Callovian.
Protocardia consobrina (Terquem & Jourdy).

Borehole at Lugoba. Lower Bajocian (Aalenian).
Bositra buchi (Roemer).

Top of hill N. of Lugoba on Msata road (B.P. loc. RBH 671). 6° 22′ 7″ S., 38° 21′ 47″ E. Callovian (?).
Praeconia rhomboidalis (Phillips).

S. of Tarawanda, 11 miles S.E. of Lugoba (locs. B 3, B 4, B 5) (Quennell *et al.*, 1956: 181). Callovian.
Grammatodon (*Indogrammatodon*) *stockleyi* Cox, *Gervillella* ? sp., *Meleagrinella echinata* (Smith), *Chlamys subtextoria* (Münster), *Trigonia* (*Frenguelliella*) *tealei* Cox, *Neritoma* (*Neridomus*) aff. *gea* (d'Orbigny), *Pseudomelania* (*Oonia*) sp.

¼ mile from Msata on road to Bagamoyo (B.P. loc. PEK 5406). 6° 19′ 45″ S., 38° 23′ 30″ E. Callovian or Oxfordian.
Lopha eruca (Defrance).

2½ miles N. of Msaka road junction, Bagamoyo district (B.P. loc. JOZ 465). 6° 17′ 30″ S., 38° 23′ 37″ E. Callovian.
Entolium briconense (Cossmann).

Usigiwa river, 6 miles W.S.W. of Kiwangwa, Bagamoyo hinterland (loc. BM 29). 6° 24′ 19″ S., 38° 30′ 23″ E. Upper Oxfordian.

Parallelodon sp., *Pteria tanganyicensis* sp. nov., *Meleagrinella radiata* (Trautschold), *Limatula moorei* sp. nov., *Trigonia* (*Frenguelliella*) *tealei* Cox, *Astarte episcopalis* de Loriol, *Fimbria quennelli* sp. nov., *Isocyprina*? sp., *Pseudotrapezium* sp., *Cercomya* sp.

Scarp face, eastern margin of Makoko plain, ¾ mile S. of Wami river, Bagamoyo hinterland (loc. BM 43). 6° 16′ 0″ S., 38° 30′ 47″ E. Upper Oxfordian.

Entolium corneolum (Young & Bird), *Protocardia*? sp., *Pleuromya uniformis* (J. Sowerby), *Bourguetia saemanni* (Oppel).

In small stream on scarp face, eastern margin of Makoko plain, 1 mile S. of Wami river, Bagamoyo hinterland (loc. BM 45). 6° 16′ 14″ S., 38° 30′ 50″ E. Oxfordian.

Grammatodon (*Indogrammatodon*) *stockleyi* Cox, *Trichites* sp., *Trigonia* (*Frenguelliella*) *tealei* Cox, *Goniomya literata* (J. Sowerby).

Top of scarp face on eastern margin of Makoko plain, 1½ miles S. of Wami river, Bagamoyo hinterland (loc. BM 46). 6° 16′ 41″ S., 38° 31′ 0″ E. Oxfordian.

Pleuromya uniformis (J. Sowerby).

Kiwate–Mkange track 5 miles S.S.E. of Mkange (loc. BM 95). 6° 7′ 37″ S., 38° 34′ 52″ E. Oxfordian–Kimmeridgian.

Meleagrinella radiata (Trautschold), *Liostrea dubiensis* (Contejean), *Exogrya nana* (J. Sowerby), *Astarte* sp., *Fimbria* sp.

Look-out hill opposite Kingura village, ½ mile N. of Wami river, Bagamoyo hinterland (loc. BM 144). 6° 14′ 25″ S., 38° 30′ 58″ E. Upper Oxfordian.

Gryphaea hennigi Dietrich.

Localities in N.E. Tanganyika

6¼ miles N.E. of Pande (village on Mkwaja–Mkata road) and 2¼ miles N. of Msangasi stream (loc. BM 292A). 5° 45′ 15″ S., 38° 39′ 10″ E. Callovian.

Oxytoma? sp., *Pinna mitis* Phillips, *Chlamys* (*Aequipecten*) cf. *palinurus* (d' Orbigny), *Chlamys* sp.

Nearly 2½ miles S.S.W. of Tengeni (village on Pangani river), in southernmost headwater tributary of Mbuzi Mkubwa stream (loc. BM 330). 5° 25′ 39″ S., 38° 39′ 33″ E. Age uncertain.

Bositra buchi (Roemer).

2 miles W. of Tengeni (village on Pangani river), in Mbuzi Mkubwa stream (loc. BM 333). 5° 24′ 42″ S., 38° 39′ 35″ E. Bathonian (?).
Pseudomelania (*Oonia*) *conica* (Morris & Lycett), *Cryptaulax bussagensis* (Cossmann), " *Nerinea* " sp., *Naricopsina* sp.

1½ miles W.N.W. of Mremere (village on Pangani river) (loc. AT 431). 5° 24′ 0″ S., 38° 50′ 14″ E. Upper Oxfordian.
Rollieria ? sp., *Lopha* sp.

About 5 miles N.E. of Tengeni (village on Pangani river), at S. end of divide separating western tributary from main Maweni valley (loc. BM 369). 5° 22′ 0″ S., 38° 44′ 51″ E. Upper Jurassic.
Entolium cingulatum (Goldfuss).

Chinamba, ¾ mile S. of Amboni quarries, Tanga (B.P. loc. ANT 4506). 5° 4′ 38″ S., 39° 3′ 3″ E. Callovian.
Oxytoma inequivalvis (J. Sowerby), *Trigonia* (*Frenguelliella*) *tealei* Cox.

½ mile N.W. of bridge over Mkulumuzi river, 2 miles W. of Tanga (B.P. loc. PEK 5402). 5° 3′ 42″ S., 39° 3′ 25″ E. Callovian.
Grammatodon (*Indogrammatodon*) *virgatus* (J. de C. Sowerby), *Chlamys* (*Spondylopecten* ?) *badiensis* Cox, *Goniomya trapezicostata* (Pusch), *Modiolus bipartitus* J. Sowerby.

Just W. of Mabokweni, 4 miles N.W. of Tanga (loc. QA 384). 5° 1′ 23″ S., 39° 3′ 0″ E. Kimmeridgian.
Gervillella aviculoides (J. Sowerby), *Myophorella quennelli* sp. nov., *Mactromya quadrata* (Roemer), *Pholadomya protei* (Brongniart), *Ampullospira quennelli* sp. nov.

Localities in the Coastal District of Kenya

Plantations N. of Dakatcha village, Malindi district (locs. 66/337, 66/338). 3° 00′ S., 39° 48′ E. (Williams 1962 : 17). Boulders, not *in situ*. Upper Jurassic.
Meleagrinella radiata (Trautschold), *Chlamys* ? sp., *Quenstedtia* ? sp., *Isocyprina* sp.

¾ mile E. of Merikano, Malindi district (loc. 66/129). 3° 8′ S., 39° 50′ E. (Thompson 1956 : 18). Boulders, not *in situ*. Upper Jurassic.
Meleagrinella radiata (Trautschold).

2 miles N.E. of Dakatcha, Malindi district (loc. 66/150). 2° 59′ S., 39° 49′ E. Boulders, not *in situ*. Upper Jurassic.
Meleagrinella radiata (Trautschold).

Chamgamwe, near Mombasa. c. 4° 2′ S., 39° 38′ E. Kimmeridgian, Chamgamwe Shales.
Lopha solitaria (J. de C. Sowerby).

Kaya Kauma, 8 miles W. of Kilifi. 3° 37′ S., 39° 44′ E. (Parsons 1929 : 69). Callovian, Miritini Shales.
Bositra buchi (Roemer).

Localities in N.E. Kenya

Didimtu hill, 2 miles N.E. of Bur Mayo (locs. 23/12, 23/355–357). 2° 57′ N., 40° 16′ E. (Ayers 1952 : 27 ; Thompson & Dodson 1960 : 20–24). Upper Lias, Toarcian, Didimtu Beds.
Nuculana (*Dacryomya*) *thompsoni* sp. nov., *Nuculana* (*Ryderia*) *kenyana* sp. nov., *Rollieria aequilatera* (Koch & Dunker), *Grammatodon kenyanus* sp. nov., *Modiolus* (*Inoperna*) *sowerbianus* (d'Orbigny), *Gervillella didimtuensis* sp. nov., *Weyla ambongoensis* (Thevenin), *Lopha costata* (J. de C. Sowerby), *Lopha olimvallata* nom. nov., *Astarte lurida* J. Sowerby, *Astarte pulfreyi* sp. nov., *Astarte didimtuensis* sp. nov., *Astarte subminima* sp. nov., *Astarte* sp., *Astarte* (*Leckhamptonia*) *hobleyi* sp. nov., *Lucina* sp., *Protocardia africana* sp. nov., *Anisocardia arkelli* sp. nov., *Anisocardia didimtuensis* sp. nov., *Anisocardia ayersi* sp. nov., *Eotrapezium*? *africanum* sp. nov., *Eotrapezium* ? *thompsoni* sp. nov., *Corbula didimtuensis* sp. nov., *Pholadomya reticulata* Agassiz, *Pleuromya didimtuensis* sp. nov., *Discohelix didimtuensis* sp. nov., *Africoconulus kenyanus* sp. nov., *Trochopsidea africana* sp. nov., *Hamusina thompsoni* sp. nov., *Purpuroidea supraliasica* sp. nov., *Promathildia* aff. *opalini* (Quenstedt), *Acteonina* (*Striactaeonina*) *supraliasica* sp. nov.

Camel track about 5 miles S. of Singu and 9 miles E. of Tarbaj (loc. 23/112). 2° 13′ N., 40° 16′ E. (Thompson & Dodson 1960 : 23). Toarcian or Bajocian, top of Didimtu Beds, just below Bur Mayo Limestones.
Nuculana (*Praesaccella*) *camelorum* sp. nov.

2 miles W. of Melka Biini and 16 miles W.N.W. of Rahmu (loc. 8/8). 4° 3′ N., 41° 2′ E. (Joubert 1960 : 12). Bathonian, Murri Limestones.
Brachidontes (*Arcomytilus*) *asper* (J. Sowerby), *Chlamys curvivarians* (Dietrich), *Lima* (*Plagiostoma*) *biiniensis* sp. nov., *Ostrea* (*Liostrea*) sp.

Hagardulun, 25 miles N.E. of Tarbaj (loc. 23/116). 2° 29′ N., 40° 22′ E. (Thompson & Dodson 1960 : 32). Bathonian–Callovian, Bur Mayo Limestones.
Nuculana (*Dacryomya*) *dodsoni* sp. nov., *Brachidontes* (*Arcomytilus*) sp., *Lima* (*Plagiostoma*) sp., *Trigonia* sp., *Pholadomya ovalis* (J. Sowerby), *Ceratomya* sp. *Exelissa dodsoni* sp. nov.

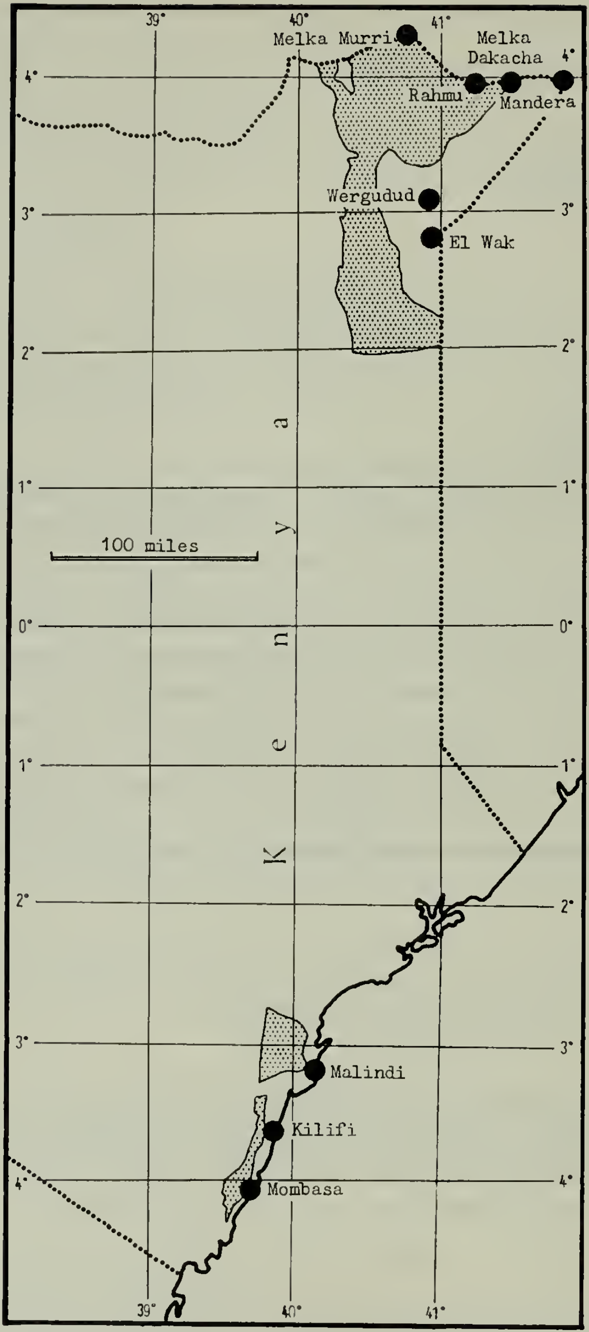

FIG. 2. Sketch-map of eastern Kenya, showing Jurassic outcrops.

Kurawe, 2 miles E. of Hagardulun, 25 miles N.E. of Tarbaj (loc. 23/78). 2° 29′ N., 40° 25′ E. (Thompson & Dodson 1960 : 32). Bathonian–Callovian, Bur Mayo Limestones.

Lima (*Plagiostoma*) sp., *Thracia* sp.

1 mile N. of Asaharbito, 28 miles N. of Wergudud (loc. 15/28). 3° 33′ N., 40° 57′ E. (Ayers 1952 : 22 ; Thompson & Dodson 1958 : 21). Bathonian [? or Callovian], Asaharbito Beds.

Nucula sp., *Grammatodon sublaevigatus* (Zieten), *Barbatia* sp., *Liostrea dubiensis* (Contejean), *Trigonia* cf. *brevicostata* Kitchin, *Astarte ayersi* sp. nov., *Sphaeriola madridi* (d'Archiac), *Isocyprina* ? sp., *Anisocardia* ? sp., *Corbula asaharbitensis* sp. nov., *Arcomya* ? sp., *Pleuromya* sp., *Cuspidaria ayersi* sp. nov., Aporrhaidae, gen. indet.

3½ miles W. of Melka Biini and 17 miles W.N.W. of Rahmu, hills N. of Rahmu–Melka Murri road (loc. 8/7). 4° 3′ N., 41° 1′ E. (Joubert, 1960 : 15). Callovian, Rukesa Shales.

Eopecten aubryi (Douvillé), *Chlamys curvivarians* (Dietrich), *Lopha gregarea* (J. Sowerby), *Lopha costata* (J. de C. Sowerby), *Liostrea* (*Catinula*) *alimena* (d'Orbigny), *Mactromya aequalis* Agassiz, *Protocardia* sp., *Homomya inornata* (J. de C. Sowerby), *Ceratomya concentrica* (J. de C. Sowerby), *Globularia* sp., *Cylindrites* ? sp.

3½ miles W. of Melka Biini and 17 miles W.N.W. of Rahmu, hills N. of Rahmu–Melka Murri road (loc. 8/5). 4° 3′ N., 41° 1′ E. (Ayers 1952 : 24 ; Joubert 1960 : 13). Callovian, Rukesa Shales.

Lopha sp., *Fimbria* sp., *Protocardia* sp., *Quenstedtia* sp.

3 miles W. of Melka Biini and 16 miles W.N.W. of Rahmu, hills N. of Rahmu–Melka Murri road (loc. 8/9). 4° 3′ N., 41° 1′ 30″ E. Callovian, Rukesa Shales.

Lopha sp., *Pholadomya lirata* (J. Sowerby), *Cercomya* sp.

13 miles W. of Rahmu, hills 4 miles S. of road to Melka Murri (loc. 16/178). 3° 58′ N., 41° 2′ E. (Joubert 1960 : 15). Callovian, Rukesa Shales.

Lopha gregarea (J. Sowerby), *Fimbria* sp. " A ", *Pholadomya* sp.

13 miles W. of Rahmu, hills 2 miles S. of road to Melka Murri (loc. 16/179). 3° 59′ N., 41° 2′ E. (Joubert 1960 : 15). Callovian, Rukesa Shales.

Lima (*Plagiostoma*) cf. *schardti* de Loriol, *Lopha gregarea* (J. Sowerby), *Ceratomyopsis basochiana* (Defrance), *Anisocardia minima* (J. Sowerby).

11 miles W. of Rahmu, hills S. of road to Melka Murri (loc. 16/176). 3° 59′ N., 41° 5′ E. (Joubert 1960 : 15). Callovian, Rukesa Shales.

Eonavicula sp., *Eopecten* sp., *Chlamys* sp., *Lima* (*Plagiostoma*) sp., *Lopha gregarea* (J. Sowerby), *Mactromya* sp., *Fimbria* sp. " A ", *Protocardia* sp.

Bed of Muddo river, 4 miles S.W. of Muddo Erri (loc. 16/195). 3° 53′ N., 41° 0′ E. (Joubert 1960 : 18). Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Lima (*Plagiostoma*) sp., *Eligmus rollandi* Douvillé, *Fimbria* sp., *Mactromya* sp., *Globularia* sp.

Kulong, 2 miles S.W. of Muddo Erri, 12 miles W. of Rahmu (loc. 16/189). 3° 54′ N., 41° 2′ E. (Joubert 1960 : 18). Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Brachidontes (*Arcomytilus*) *asper* (J. Sowerby), *Brachidontes* (*Arcomytilus*) *laitmairensis* (de Loriol), *Eligmus rollandi* Douvillé, *Entolium corneolum* (Young & Bird), *Eopecten aubryi* (Douvillé), *Camptonectes auritus* (Schlotheim), *Chlamys curvivarians* (Dietrich), *Lima* (*Plagiostoma*) cf. *biiniensis* sp. nov., *Lima* (*Plagiostoma*) cf. *jumaraensis* Cox, *Lima* (*Plagiostoma*) cf. *schardti* de Loriol, *Lima* (*Plagiostoma*) sp., *Pseudolimea duplicata* (J. de C. Sowerby), *Liostrea* sp., *Liostrea* (*Catinula*) *alimena* (d'Orbigny), *Trigonia* sp., *Lucina* cf. *lirata* Phillips, *Mactromya aequalis* Agassiz, *Fimbria* sp. " B ", *Protocardia* sp., *Ceratomyopsis basochiana* (Defrance), *Pholadomya ovalis* (J. Sowerby), *Pholadomya* sp., *Ceratomya concentrica* (J. de C. Sowerby).

Muddo Erri, 12 miles W. of Rahmu (loc. 16/172). 3° 56′ N., 41° 4′ E. (Joubert 1960 : 18). Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Eonavicula sp. " A ", *Eligmus rollandi* Douvillé, *Eopecten aubryi* (Douvillé), *Chlamys* sp., *Lima* (*Plagiostoma*) *muddoensis* sp. nov., *Mactromya aequalis* Agassiz, *Fimbria* sp. " A ", *Fimbra* sp. " B ", *Protocardia* ? sp.

14 miles W.S.W. of Rahmu (loc. 16/41). 3° 52′ N., 41° 2′ E. (Ayers 1952 : 23). Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Eligmus rollandi Douvillé, *Lima* (*Plagiostoma*) sp., *Exogyra* ? sp., *Mactromya aequalis* Agassiz, *Fimbria* ? sp., *Homomya* sp., *Ceratomya wimmisensis* Gilliéron.

9 miles W. of Rahmu, hills S. of Rahmu–Melka Murri road (loc. 16/175). 3° 59′ N., 41° 6′ E. Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Lima (*Plagiostoma*) sp., *Fimbria* sp. " A ".

10 miles W. of Rahmu, top of hills S. of Rahmu–Melka Murri road (loc. 16/139). 3° 59′ N., 41° 5′ E. Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Camptonectes auritus (Schlotheim), *Chlamys curvivarians* (Dietrich), *Liostrea* (*Catinula*) *alimena* (d'Orbigny), " *Pleurotomaria* " sp., Nerineidae, gen. indet.

6 miles W. of Rahmu, hillside S. of Rahmu–Melka Murri road (loc. 16/162). 3° 58′ N., 41° 9′ E. Callovian [?-Lower Oxfordian], Muddo Erri Limestones.

Eligmus rollandi Douvillé, *Eopecten aubryi* (Douvillé), *Lima* (*Plagiostoma*) sp., *Lopha gregarea* (J. Sowerby), *Lopha costata* (J. de C. Sowerby).

River section west of Rahmu–El Wak road, 5½ miles S.W. of Rahmu (loc. 16/164, 16/146). 3° 52′ N., 41° 12′ E. (Joubert 1960 : 20). Oxfordian, Rahmu Shales.
Grammatodon (*Indogrammatodon*) sp., *Lopha solitaria* (J. de C. Sowerby), *Protocardia rahmuensis* sp. nov.

6½ miles S.S.W. of Rahmu (loc. 16/44). 3° 52′ N., 41° 10′ E. (Ayers 1952 : 26). Oxfordian, Rahmu Shales.
Lopha sp., *Lopha gregarea* (J. Sowerby), *Lopha* cf. *intricata* (Contejean).

1¾ miles S.W. of Rahmu (locs. 16/66, 16/67). 3° 54′ N., 41° 12′ E. (Ayers 1952 : 25). Oxfordian, Rahmu Shales.
Lopha gregarea (J. Sowerby), *Lopha solitaria* (J. de C. Sowerby).

2½ miles S.W. of Rahmu (loc. 16/64). 3° 52′ 30″ N., 41° 12′ E. (Ayers 1952 : 25 ; Joubert 1960 : 19). Oxfordian, Rahmu Shales.
Mytilus (*Falcimytilus*) *jurensis* Roemer, *Stegoconcha* sp., *Camptonectes auritus* (Schlotheim), *Lima* (*Plagiostoma*) *rahmuensis* sp. nov., *Exogyra nana* (J. Sowerby), *Isocyprina* sp.

Uacha, 6 miles S. of Rahmu (loc. 16/219). 3° 51′ N., 41° 13′ E. (Joubert 1960 : 20). Oxfordian, Rahmu Shales.
Protocardia rahmuensis sp. nov., *Homomya rahmuensis* sp. nov.

Muguda, 24 miles S.W. of El Wak (loc. 23/217). 2° 31′ N., 40° 43′ E. (Baker & Saggerson 1958 : 18). Oxfordian (?).
Entolium sp., *Chlamys* sp.

Waldire, 20 miles N.E. of Aus Mandula (loc. 23/250, 23/252). 2° 28′ N., 40° 46′ E. (Baker & Saggerson 1958 : 18). Oxfordian (?).
Entolium corneolum (Young & Bird), *Protocardia* sp.

Romicho, 25 miles S.W. of El Wak. 2° 36′ N., 40° 39′ E. (loc. 23/275–277) (Baker & Saggerson 1958 : 18). Oxfordian, beds immediately underlying Golberobe Beds.
Cucullaea (*Megacucullaea* ?) sp., *Mytilus* (*Falcimytilus*) *jurensis* Roemer.

Golberobe hills, half-way between Wergudud and Takabba (loc. 15/227–228). 3° 23′ N., 40° 32′ E. Oxfordian, Golberobe Beds.
Lopha sp., *Lopha solitaria* (J. de C. Sowerby), *Liostrea dubiensis* (Contejean).

Korkai Hammassa, 19 miles E. of Takabba (loc. 15/443–466). 3° 22′ N., 40° 29′ E. (Saggerson & Miller 1957 : 14). Oxfordian, Golberobe Beds.
Nucula sp., *Modiolus imbricatus* (J. Sowerby), *Modiolus* (*Inoperna*) *sowerbianus* (d'Orbigny), *Gervillia saggersoni* sp. nov., *Meleagrinella radiata* (Trautschold),

Lopha tifoensis sp. nov., *Trigonia* sp., *Astarte* sp., *Mactromya* sp., *Protocardia* sp., *Isocyprina* ? sp., *Tancredia* sp. " A ", *Quenstedtia* sp., *Cercomya* sp.

Ogar Wein hills, 17 miles N.W. of Wergudud (loc. 15/535–575). 3° 24′ N., 40° 45′ E. (Saggerson & Miller 1957 : 14, 23). Oxfordian, Golberobe Beds.
Cucullaea sp., *Mytilus* (*Falcimytilus*) *tifoensis* sp. nov., *Gervillia saggersoni* sp. nov., *Meleagrinella radiata* (Trautschold), *Liostrea dubiensis* (Contejean), *Exogyra nana* (J. Sowerby), *Lopha tifoensis* sp. nov., *Tancredia* sp. " B ", *Quenstedtia* sp.

Tifo, Garri hills, 14 miles N. of Wergudud (loc. 15/380–441, 15/584–586). 3° 23′ N., 40° 56′ E. (Saggerson & Miller 1957 : 14, 42). Oxfordian, Golberobe Beds.
Modiolus imbricatus (J. Sowerby), *Modiolus* (*Inoperna*) *sowerbianus* (d'Orbigny), *Mytilus* (*Falcimytilus*) *tifoensis* sp. nov., *Mytilus* (*Falcimytilus*) *dietrichi* sp. nov., *Brachidontes* (*Arcomytilus*) *laitmairensis* (de Loriol), *Gervillella siliqua* (Eudes-Deslongchamps), *Inoceramus* sp., *Placunopsis* sp., *Exogyra nana* (J. Sowerby), *Lopha tifoensis* sp. nov., *Lopha* sp., *Trigonia* sp., *Protocardia* sp.

Kailta, Golberobe hills, 22 miles E. of Takabba (locs. 15/599, 15/613). 3° 20′ 7″ N., 40° 31′ E. (Saggerson & Miller 1957 : 12, 13, 42). Oxfordian, Golberobe Beds.
Mactromya quadrata (Roemer), *Mactromya* sp., *Corbula kailtaensis* sp. nov.

Asahaba, 19 miles N.N.E. of Wergudud (locs. 15/229, 230). 3° 26′ N., 40° 58′ E. (Saggerson & Miller 1957 : 23). Oxfordian, Golberobe Beds.
Inoceramus sp., *Lopha* sp., *Lopha tifoensis* sp. nov.

Chimpa, 20 miles N.W. of Wergudud (loc. 15/223). 3° 25′ N., 40° 35′ 30″ E. (Saggerson & Miller 1957 : 14). Oxfordian, Golberobe Beds.
Meleagrinella radiata (Trautschold), *Lopha tifoensis* sp. nov.

Dirahara, 24 miles E.N.E. of Aus Mandula (loc. 23/280, 281). 2° 22′ N., 40° 53′ E. (Baker & Saggerson 1958 : 19, 23). Oxfordian, Golberobe Beds.
Mytilus (*Falcimytilus*) *dietrichi* sp. nov.

3 miles E. of Waldire, 24 miles N.E. of Aus Mandula (loc. 23/258). 2° 29′ N., 40° 49′ E. (Baker & Saggerson 1958 : 22). Oxfordian, Golberobe Beds.
Protocardia sp.

8 miles N.W. of Ogar Wein hills (loc. 15/38*a*). 3° 22′ N., 40° 39′ E. (Ayers 1952 : 23). Horizon uncertain.
Meleagrinella radiata (Trautschold).

Danissa, 8 miles N. of Wergudud (loc. 15/592). 3° 19′ N., 4° 52′ E. (Saggerson & Miller 1957 : 42). Horizon uncertain.
Quenstedtia sp.

17 miles S. of Rahmu (loc. 16/190). 3° 40′ N., 41° 11′ E. (Joubert 1960 : 24). Upper Oxfordian, Seir Limestones.

Meleagrinella radiata (Trautschold), *Mactromya quadrata* (Roemer).

7 miles N.N.E. of Raiya hills (loc. 16/16). 3° 52′ N., 41° 26′ E. (Ayers 1952 : 26). Upper Oxfordian, Seir Limestones.

Eopecten thurmanni (Brauns).

Koblollo, 15 miles S.S.W. of Rahmu (loc. 16/217). 3° 45′ N., 41° 8′ E. Upper Oxfordian, Seir Limestones.

Procerithiidae, etc. genera indet.

Wilderri hill, 11 miles S.S.W. of Rahmu (loc. 16/145). 3° 47′ N., 41° 9′ 30″ E. (Joubert 1960 : 23). Upper Oxfordian, Seir Limestones.

Grammatodon (*Indogrammatodon*) *stockleyi* Cox, *Modiolus* (*Inoperna*) sp., *Entolium corneolum* (Young & Bird), *Eopecten* aff. *albus* (Quenstedt), *Chlamys* sp., *Lopha gregarea* (J. Sowerby), *Lopha solitaria* (J. de C. Sowerby), *Exogyra* sp., *Anisocardia* sp., *Ceratomya wilderriensis* sp. nov., *Pseudomelania* (*Rhabdoconcha*) *wilderriensis* sp. nov., *Bourguetia saemanni* (Oppel), *Ampullospira dejanira* (d'Orbigny), *Harpagodes* ? sp.

Low hills at Dussé, 1½ miles S.E. of Rahmu (loc. 16/166). 3° 55′ N., 41° 15′ E. (Joubert 1960 : 23). Upper Oxfordian, Seir Limestones.

Grammatodon (*Indogrammatodon*) *irritans* (Hennig), *Mytilus* (*Falcimytilus*) *jurensis* Roemer, *Stegoconcha gmuelleri* (Krenkel), *Eopecten* sp., *Camptonectes auritus* (Schlotheim), *Chlamys* (*Radulopecten*) *inaequicostata* (Young & Bird), *Lima* (*Plagiostoma*) sp., *Pseudolimea duplicata* (J. de C. Sowerby), *Lopha solitaria* (J. de C. Sowerby), *Liostrea dubiensis* (Contejean), *Astarte huralensis* Stefanini, *Ceratomya wilderriensis* sp. nov., *Pseudomelania dusseensis* sp. nov., *Bourguetia saemanni* (Oppel), *Pietteia dusseensis* sp.nov., *Ampullospira dejanira* (d'Orbigny), *Globularia phasianelloides* (d'Orbigny).

3 miles E. of Rahmu, hillside S. of road to Mandera (loc. 16/158). 3° 56′ N., 41° 17′ E. Upper Oxfordian, Seir Limestones.

Nerinella cutleri sp. nov.

5 miles W.S.W. of Rahmu (loc. 16/57). 3° 54′ N., 41° 10′ E. (Ayers 1952 : 24). Horizon uncertain.

Entolium corneolum (Young & Bird).

6 miles N.N.E. of Raiya hills and 5 miles W.S.W. of Melka Kunha (loc. 16/17). 3° 52′ N., 41° 26′ E. Kimmeridgian, Hereri Shales.

Eopecten sp., *Liostrea* sp.

Hereri river crossing, 3 miles S. of Melka Kunha, 16 miles E. of Rahmu (locs. 16/

150, 16/221). 3° 55′ N., 41° 28′ E. (Joubert 1960 : 26). Kimmeridgian, Hereri Shales.

Grammatodon (*Indogrammatodon*) *irritans* (Hennig), *Mytilus* (*Falcimytilus*) *jurensis* Roemer, *Eopecten thurmanni* (Brauns), *Chlamys curvivarians* (Dietrich), *Liostrea* sp., *Exogyra nana* (J. Sowerby), *Lucina* sp., *Protocardia* (*Tendagurium*) *bannesiana* (Contejean), *Ceratomyopsis striata* (d'Orbigny), *Ceratomya excentrica* (Roemer), *Bourguetia saemanni* (Oppel), Procerithiidae, *Harpagodes* sp.

1 mile W. of Melka Dakacha (cited as " Daua valley 18½ miles E. of Rahmu ") (loc. 16/33). 3° 58′ N., 41° 29′ 30″ E. (Ayers 1952 : 26). Upper Kimmeridgian, Dakacha Limestones.

Trochalia depressa (Voltz).

6¾ miles S.W. of the Raiya hills and S.E. of Garba Raiya (loc. 16/52). 3° 44′ N., 41° 20′ E. Upper Kimmeridgian, Dakacha Limestones.

Fimbria sp.

N. of Figfirya, northern Raiya hills (loc. 16/165). 3° 50′ N., 41° 24′ E. Upper Kimmeridgian, Dakacha Limestones.

Liostrea sp., *Protocardia* sp., *Quenstedtia jouberti* sp. nov., *Homomya* sp., *Harpagodes thirriae* (Contejean), *Globularia hemisphaerica* (Roemer).

1 mile S.W. of Melka Dakacha (cited as " S. of Rahmu–Mandera road, 19 miles E. of Rahmu ") (loc. 16/31). 3° 57′ N., 41° 30′ E. (Ayers 1952 : 24). Upper Kimmeridgian, Dakacha Limestones.

Harpagodes thirriae (Contejean).

10½ miles S.W. of the Raiya hills (loc. 16/55). 3° 43′ N., 41° 14′ E. (Ayers 1952 : 24). Upper Kimmeridgian, Dakacha Limestones.

Harpagodes thirriae (Contejean).

3 miles N.E. of Melka Dakacha (loc. 16/201). 3° 59′ N., 41° 33′ E. (Joubert 1960 : 28). Upper Kimmeridgian, Dakacha Limestones.

Modiolus virgulinus (Thurmann & Étallon), *Modiolus* (*Inoperna*) *perplicatus* (Étallon), *Lopha gregarea* (J. Sowerby), *Myophorella* sp., *Rutitrigonia stefaninii* Venzo, *Mactromya quadrata* (Roemer), *Harpagodes thirriae* (Contejean), *Globularia hemisphaerica* (Roemer).

Melka Dakacha (loc. 16/192, 16/193). 3° 57′ N., 41° 31′ E. (Joubert 1960 : 28). Upper Kimmeridgian, Dakacha Limestones.

Ctenostreon proboscideum (J. Sowerby), *Globularia hemisphaerica* (Roemer), *Trochalia depressa* (Voltz), *Actaeonina* ? sp.

2 miles S. of Melka Dakacha (locs. 16/157, 16/209). 3° 57′ N., 41° 30′ E. Upper Kimmeridgian, Dakacha Limestones.

Nuculoma (*Palaeonucula*) *bellozanensis* sp. nov., *Pteria* sp., *Rutitrigonia stefaninii* Venzo, *Mactromya* sp., *Eocallista* ? sp., *Protocardia* sp., *Globularia hennigi* sp. nov., *Globularia phasianelloides* (d'Orbigny).

W. slope, Finno, Hegalu hills (loc. 16/130). 3° 28′ N., 41° 31′ E. (Joubert 1960 : 27, pl. 11, fig. 5). Upper Kimmeridgian, Dakacha Limestones.
Camptonectes sp., *Chlamys curvivarians* (Dietrich), *Lopha* sp., *Pholadomya* sp.

Hegalu hills, 2 miles N. of Finno (loc. 16/211). 3° 28′ 30″ N., 41° 32′ E. (Joubert 1960 : 26). Upper Kimmeridgian, Dakacha Limestones.
Pholadomya hemicardia Roemer.

5 miles S. of Galgali Gambo (loc. 16/29). 3° 53′ N., 41° 22′ E. (Ayers 1952 : 23). Upper Kimmeridgian, Dakacha Limestones.
Lima (*Plagiostoma*) *sublaeviuscula* Krumbeck.

Hill-top 1 mile W.S.W. of Melka Dakacha (loc. 16/147, 16/149). 3° 58′ N., 41° 30′ E. Kimmeridgian, Hereri Shales overlain by Dakacha Limestones.
Ceratomya excentrica (Roemer), *Trochalia depressa* (Voltz).

Matasafara, 15 miles W. of Mandera (loc. 16/112). 3° 58′ N., 41° 39′ E. (Joubert 1960 : 32, 34). Uppermost Jurassic, Gudediye Beds.
Protocardia sp., *Tancredia manderaensis* sp. nov., *Myopholas manderaensis* sp. nov.

W. slope of hill ½ mile E. of Hafura (loc. 16/129). 3° 29′ 30″ N., 41° 30′ E. Uppermost Jurassic or basal Cretaceous, Danissa Beds.
Trigonia dainellii Venzo.

Odda (loc. 16/207). 3° 39′ N., 41° 23′ E. (Joubert 1960 : 40). Uppermost Jurassic or basal Cretaceous, Danissa Beds.
Trigonia dainellii Venzo.

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tanganyicensis, *Pictavia*, 167
tanganyicensis, *Pteria*, 42
tealei, Trigonia (*Frenguelliella*), 78
Tendagurium, 105
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Weyla, 59
wilderriensis, *Ceratomya*, 134
wilderriensis, *Pseudomelania* (*Rhabdoconcha*), 151
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Zygopleura, 154

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PLATE 1

FIG. 1. *Palaeoneilo asaharbitensis* sp. nov. Bathonian [? or Callovian], Asaharbito Beds. 1 mile N. of Asaharbito, N.E. Kenya. Holotype, L.83864, × 1 . . p. 25

FIGS. 2*a*, *b*, *c*. *Nuculana* (*Dacryomya*) *dodsoni* sp. nov. Bathonian-Callovian, Bur Mayo Limestones. Hagardulun, 25 miles N.E. of Tarbaj, N.E. Kenya. *a*, type series (L.98274) on bedding plane, × 1 ; *b*, small group of paratypes, × 2 ; *c*, holotype, L.98280, × 2 . . . . p. 27

FIGS. 3*a*, *b*. *Nuculoma* (*Palaeonucula*) *bellozanensis* (de Loriol). Upper Kimmeridgian, Dakacha Limestones. 2 miles S. of Melka Dakacha, N.E. Kenya. Holotype, L.92293 : *a*, × 1 ; *b*, × 2·5 . . . . p. 25

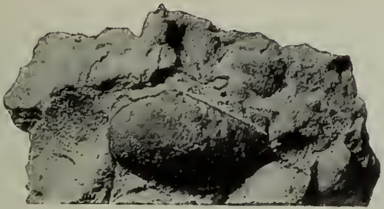
FIGS. 4*a*, *b*, *c*. *Nuculana* (*Dacryomya*) *thompsoni* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35000 : *a*, × 1 ; *b*, *c*, × 2·25 . . . . p. 26

FIGS. 5*a*, *b*, *c*. *Rollieria aequilatera* (Koch & Dunker). Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. LL.35005 : *a*, × 1 ; *b*, *c*, × 3 . . p. 29

FIGS. 6*a*, *b*, *c*. *Nuculana* (*Ryderia*) *kenyana* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, L.35001 : *a*, × 1 ; *b*, *c*, × 2, posterior end of shell restored . . . . p. 27

FIGS. 7*a*, *b*. *Parallelodon pindiroensis* sp. nov. Bajocian (?), Pindiro Shales. Lihimaliao creek, Mandawa area, Tanganyika. Holotype, LL.35086, × 1 . . . p. 29

FIGS. 8*a*, *b*. Same species, horizon and locality. Paratype, LL. 35087, × 1 . p. 29



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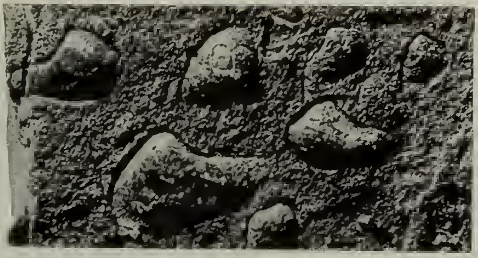

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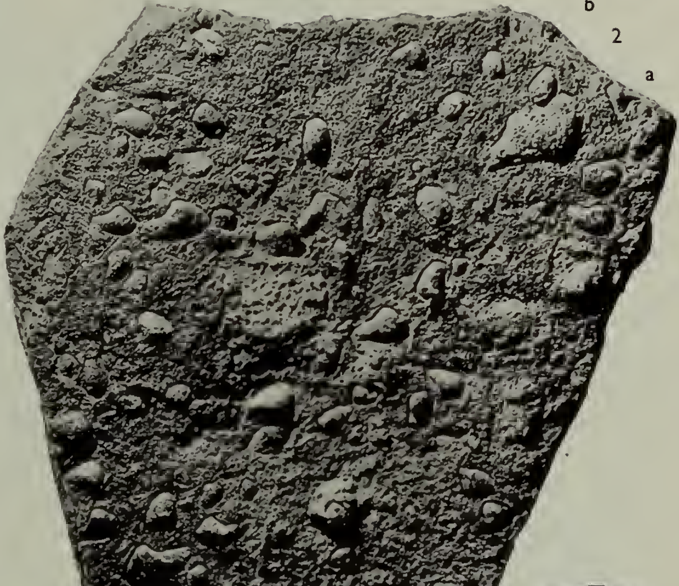

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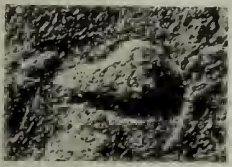

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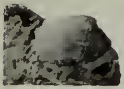

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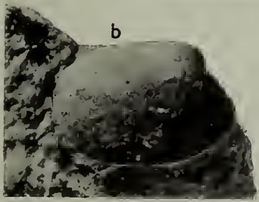

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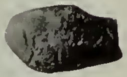

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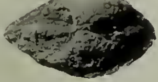

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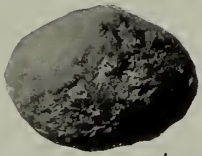

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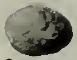

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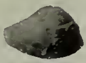

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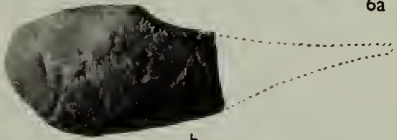

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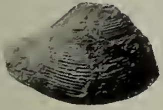

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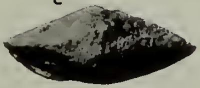

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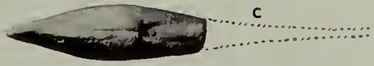

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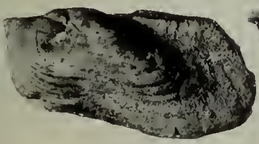

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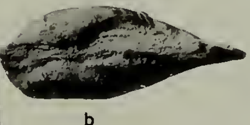

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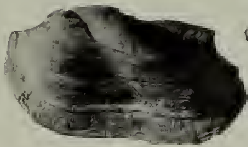

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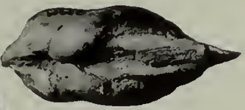

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PLATE 2

FIGS. 1*a*, *b*, *c*. *Grammatodon kenyanus* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35006 : *a*, × 1 ; *b*, *c*, × 2 . p. 30

FIGS. 2*a*, *b*. Same species, horizon and locality. Paratype, LL.35007 ; *a*, × 1 ; *b*, × 2 . . . . p. 30

FIG. 3. *Grammatodon* (*Indogrammatodon*) *irritans* (Hennig). Upper Kimmeridgian, " *Trigonia smeei* " Bed. 4th Kipande flag, W. of Tendaguru hill, Tanganyika. L.52698, × 1 . . . . p. 32

FIG. 4. *Grammatodon* (*Indogrammatodon*) *virgatus* (J. de C. Sowerby). Callovian ? Lonji creek, W. of Mandawa, Tanganyika. Right valve, LL.35089, × 1 . . . p. 31

FIG. 5. Same species, horizon and locality. Left valve, LL.35090, × 1 . . p. 31

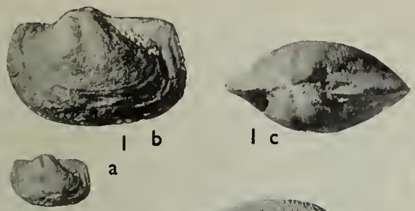
FIGS. 6*a*, *b*. *Grammatodon* (*Indogrammatodon*) *matapwaensis* sp. nov. Upper Kimmeridgian, N. of Matapwa, Pindiro area, Tanganyika. Holotype, LL.35091 : *a*, × 1 ; *b*, × 3 . . . . p. 32

FIG. 7. *Grammatodon sublaevigatus* (Zieten). Bathonian [? or Callovian], Asaharbito Beds. 1 mile N. of Asaharbito, N.E. Kenya. L.83683, × 1 . . . . . p. 30

FIGS. 8*a*, *b*. *Eonavicula* sp. " A ". Callovian [?–Lower Oxfordian], Muddo Erri Limestones. Muddo Erri, 12 miles W. of Rahmu, N.E. Kenya. L.92046, × 1 . p. 35

FIG. 9. *Grammatodon* (*Indogrammatodon*) *stockleyi* Cox. Upper Oxfordian, Seir Limestones. Wilderri hill, 11 miles S.S.W. of Rahmu, N.E. Kenya. L.92249, × 1 p. 31

FIGS. 10*a*, *b*. *Nuculana* (*Praesaccella*) *camelorum* sp. nov. Toarcian or Bajocian, top of Didimtu Beds. Camel track about 5 miles S. of Singu, N.E. Kenya. *a*, type series (L.98280) on bedding plane, × 1 ; holotype (bottom right-hand corner) and group of paratypes, × 2 . . . . p. 28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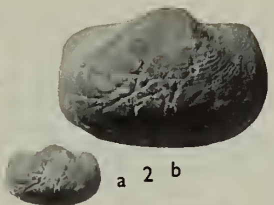
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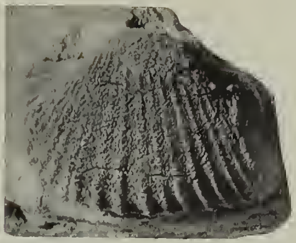
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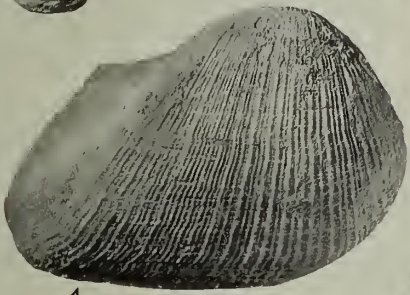
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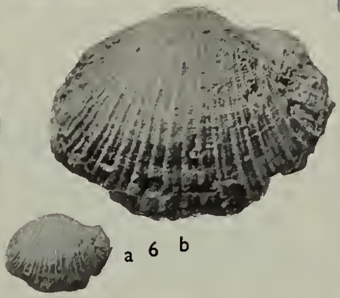
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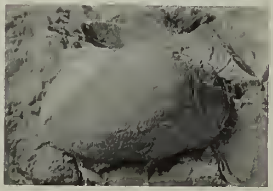
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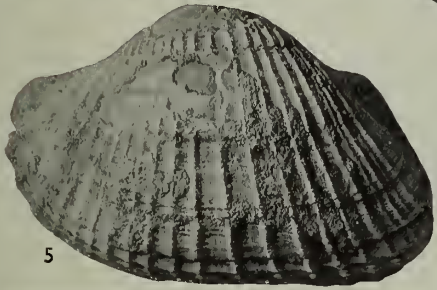
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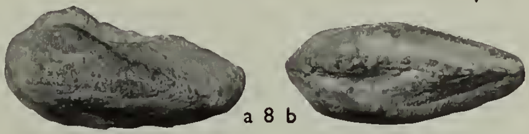
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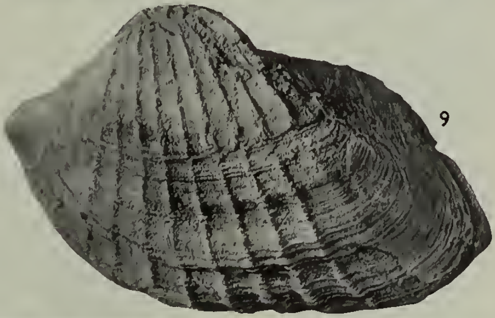
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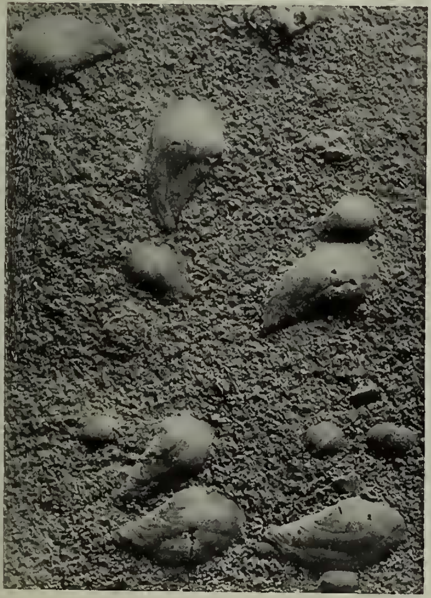
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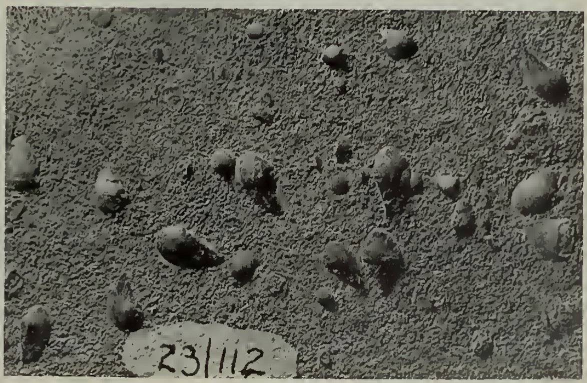


PLATE 3

Figs. 1*a*, *b*. *Cucullaea kipandeensis* sp. nov. Upper Kimmeridgian, *Nerinella* Bed. Kipande path, W. of Tendaguru, Tanganyika. Holotype, L.53146, × 1 . . p. 34

Fig. 2. *Eonavicula* sp. " B ". Upper Kimmeridgian, *Nerinella* Bed. Kindope, N.N.W. of Tendaguru, Tanganyika. LL.11517, × 1 . . . . p. 35

Figs, 3*a*, *b*. *Apolinter kindopeensis* sp. nov. Upper Kimmeridgian, *Nerinella* Bed. Kindope, N.N.W. of Tendaguru, Tanganyika. Holotype, L.56243 : *a*, × 1 ; *b*, × 2 p. 33

Figs. 4*a*, *b*. Same species, horizon and locality. Paratype, L.56244 : *a*, × 1 ; *b*, × 2 . . . . p. 33

Fig. 5. *Modiolus imbricatus* (J. Sowerby). Oxfordian, Golberobe Beds. Tifo, 14 miles N. of Wergudud, N.E. Kenya. L.93579, × 1 . . . . p. 36

Fig. 6. Same species. Bajocian (?), Pindiro Shales. Lihimaliao creek, Mandawa area, Tanganyika. LL.35196, × 1 . . . . p. 36

Fig. 7. *Modiolus anatinus* (Smith). Bajocian, Station Beds. Kidugallo Station, Central Railway, Tanganyika. LL.11554, × 1 . . . . p. 37

Fig. 8. *Modiolus virgulinus* (Thurmann & Étallon). Upper Kimmeridgian, Dakacha Limestones. 3 miles N.E. of Melka Dakacha, N.E. Kenya. L.92181, × 1 . . p. 38

Fig. 9. *Modiolus bipartitus* (J. Sowerby). Upper Kimmeridgian, "*Trigonia smeei*" Bed. Tingutitinguti creek, Tendaguru, Tanganyika. L.52087, × 1 . . . p. 37

Fig. 10. *Modiolus* (*Inoperna*) *sowerbianus* (d'Orbigny). Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. LL.35010, × 1 . . . p. 38

Fig. 11. Same species, horizon and locality. LL.35011, × 1 . . . p. 38

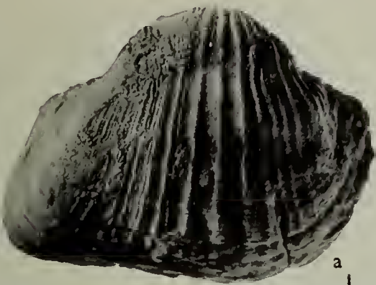
Fig. 12. *Mytilus* (*Falcimytilus*) *tifoensis* sp. nov. Oxfordian, Golberobe Beds. Ogar Wein hills, 17 miles N.W. of Wergudud, N.E. Kenya. Holotype, L.93615, × 1 . p. 39

Fig. 13. Same species, horizon and locality. Paratype, L.93617, × 1 . . p. 39

Fig. 14. *Modiolus* (*Inoperna*) *perplicatus* (Étallon). Upper Kimmeridgian. Tendaguru, Tanganyika. L.52153, × 1 . . . . p. 39

Fig. 15. *Mytilus* (*Falcimytilus*) *dietrichi* sp. nov. Upper Kimmeridgian, "*Trigonia smeei*" Bed. Tendaguru, Tanganyika. Holotype, L.52187, × 1 . . . . p. 40

Fig. 16. Same species, horizon and locality. Paratype, L.52188, × 1 . . p. 40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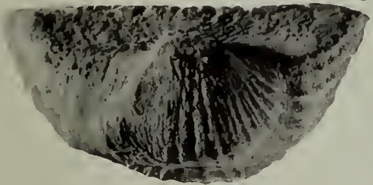
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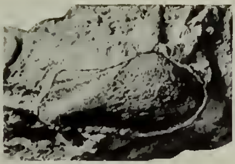
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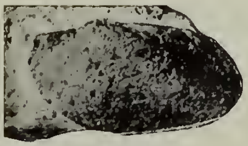
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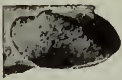
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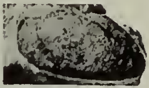
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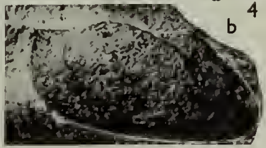
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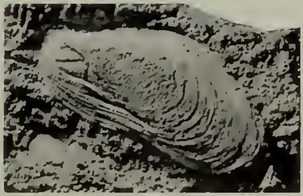
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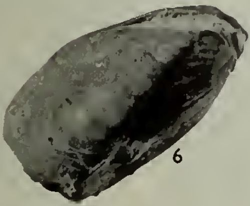
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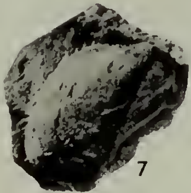
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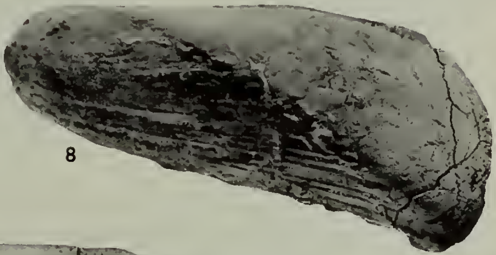
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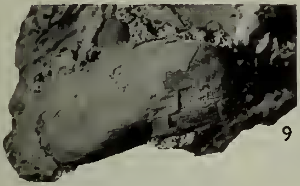
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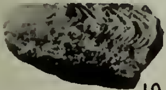
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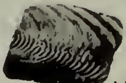
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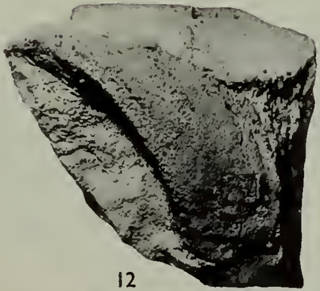
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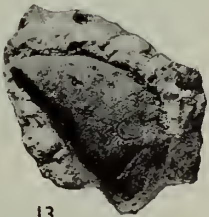
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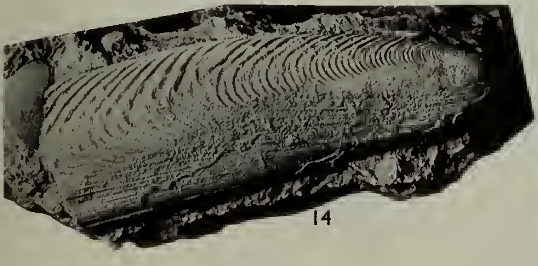
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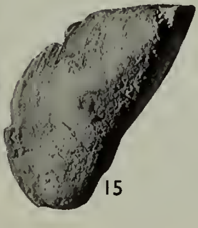
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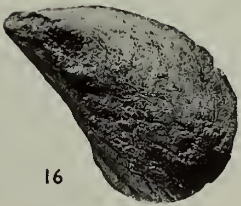
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PLATE 4

FIGS. 1*a*, *b*. *Musculus kindopeensis* sp. nov. Upper Kimmeridgian, *Nerinella* Bed. Kindope, N.N.W. of Tendaguru, Tanganyika. Holotype, LL.11331 : *a*, × 1 ; *b*, × 3 p. 39

FIGS. 2*a*, *b*. *Brachidontes* (*Arcomytilus*) *asper* (J. Sowerby). Callovian [?–Lower Oxfordian], Muddo Erri Limestones. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya. L.92067 : *a*, × 1 ; *b*, × 2 . . . . p. 41

FIG. 3. *Brachidontes* (*Arcomytilus*) *laitmairensis* (de Loriol). Upper Kimmeridgian. N. of Matapwa, Pindiro area, Tanganyika. LL.35094, × 1·5 . . . . . p. 41

FIG. 4. *Pteria tanganyicensis* sp. nov. Upper Oxfordian. Usigiwa river, 6 miles W.S.W. of Kiwangwa, Bagamoyo hinterland, Tanganyika. Holotype, LL.16793, × 1 p. 42

FIGS. 5*a*, *b*. *Gervillella didimtuensis* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35012 : *a*, exterior ; *b*, interior, showing hinge-teeth, both × 1 . . . . p. 43

FIG. 6. Same species, horizon and locality. Paratype, LL.35013 : interior, showing hinge-teeth, × 1 . . . . p. 43

FIGS. 7*a*, *b*. *Gervillella orientalis* (Douvillé). Bajocian (?), Pndiro Shales. Near site of Mandawa well no. 1, Tanganyika. LL.35197, × 1 . . . . . . p. 43

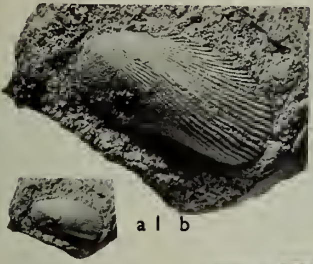
FIG. 8. Same species, horizon and locality. LL.35198, × 1 . . . . . p. 43

FIG. 9. *Pinna buchii* Koch & Dunker. Bajocian (?), Pindiro Shales. Near site of Mandawa well no. 1, Tanganyika. LL.35095, × 1 . . . . p. 45

FIG. 10. *Gervillella siliqua* (Eudes-Deslongchamps). Oxfordian, Golberobe Beds. Tifo, 14 miles N. of Wergudud, N.E. Kenya. L. 92032, × 1 . . . . . p. 44

FIG. 11. *Gervillia saggersoni* sp. nov. Oxfordian, Golberobe Beds. Korkai Hammassa, 19 miles E. of Takabba, N.E. Kenya. Holotype, L.93622, × 1 . . . p. 45

PLATE 4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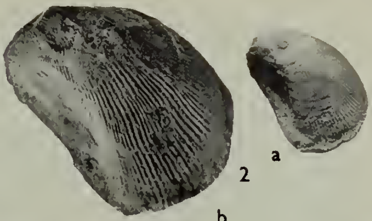
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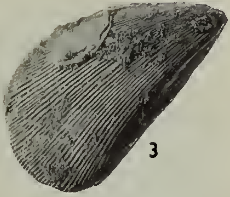
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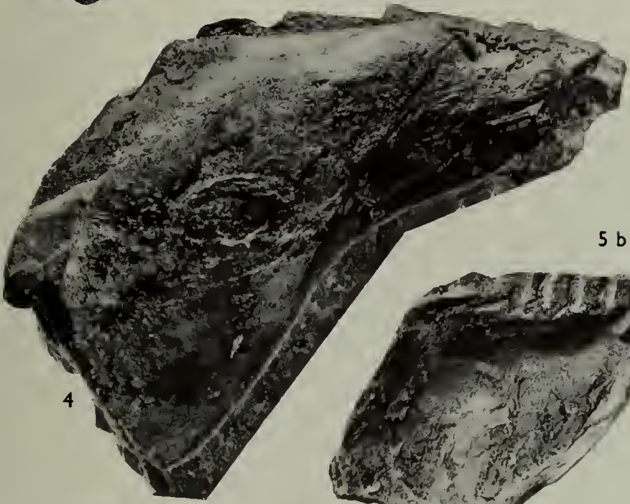
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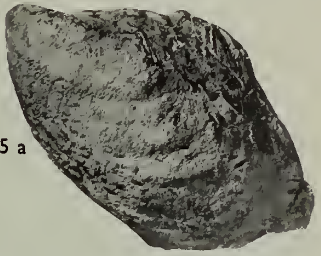
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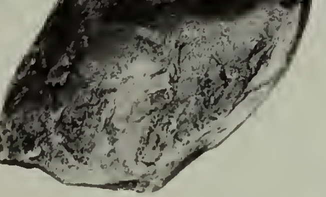
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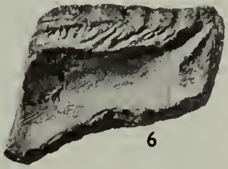
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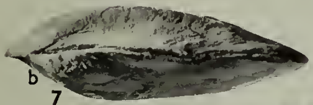
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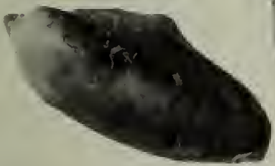
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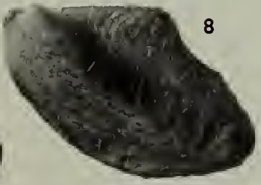
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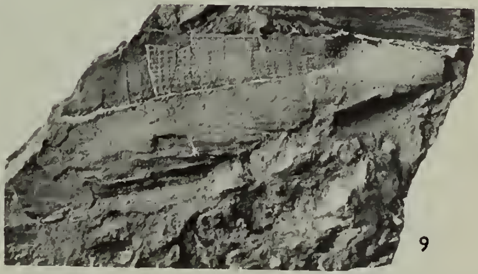
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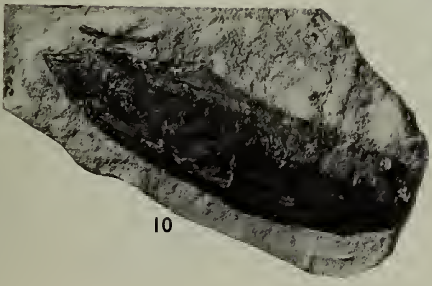
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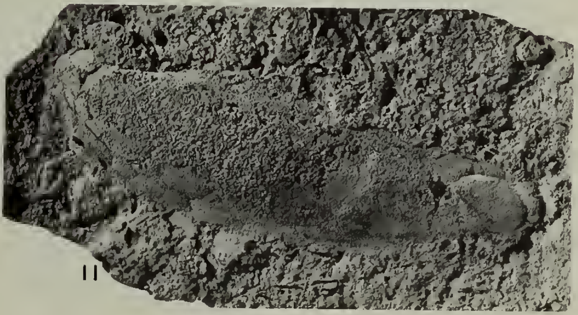
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PLATE 5

FIGS. 1*a*, *b*. *Meleagrinella radiata* (Trautschold). Upper Kimmeridgian, "*Trigonia smeei*" Bed. Tapaira trail, S. of Tendaguru, Tanganyika. Right valve, L.52166 : *a*, × 1 ; *b*, × 2 . . . . p. 48

FIGS. 2*a*, *b*. Same species and horizon. Tingutitinguti creek, Tendaguru, Tanganyika. Left valve, L.52090 : *a*, × 1 ; *b*, × 2 . . . . p. 48

FIGS. 3*a*, *b*. Same species. Oxfordian, Golberobe Beds. Korkai Hammassa, 19 miles E. of Takabba, N.E. Kenya. Left valve, L.93649 : *a*, × 1 ; *b*, × 2 . . p. 48

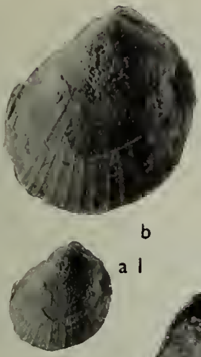
FIGS. 4*a*, *b*. Same species. Upper Kimmeridgian, "*Trigonia smeei*" Bed. Road to Kindope, N. of Tendaguru, Tanganyika. Left valve, L.51136 : *a*, × 1 ; *b*, × 2 . p. 48

FIG. 5. *Eligmus rollandi* Douvillé. Callovian [?–Lower Oxfordian], Muddo Erri Limestones. 6 miles W. of Rahmu, N.E. Kenya. L.92104, × 1 . . . . . p. 47

FIG. 6. Same species and horizon. 14 miles W.S.W. of Rahmu, N.E. Kenya. L.83893, × 1 . . . . p. 47

FIG. 7. *Oxytoma inequivalvis* (J. Sowerby). Callovian. Chinamba, ¾ mile S. of Amboni quarries, Tanga, Tanganyika. Left valve, LL.35166, × 1 . . . . p. 47

FIG. 8. *Stegoconcha gmuelleri* (Krenkel). Upper Kimmeridgian, *Nerinella* Bed. N. of Kipande north flag, Tendaguru, Tanganyika. L.51168, × 1 . . . . p. 47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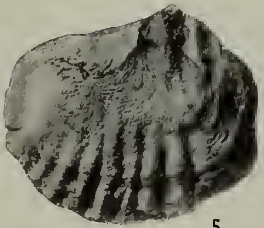
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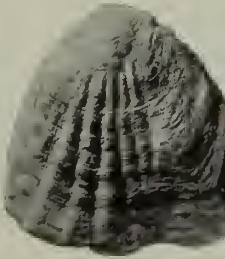
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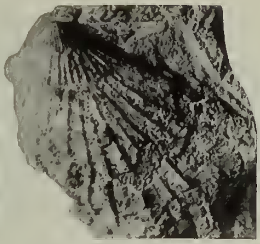
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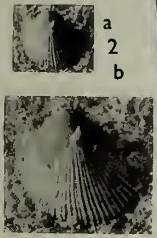
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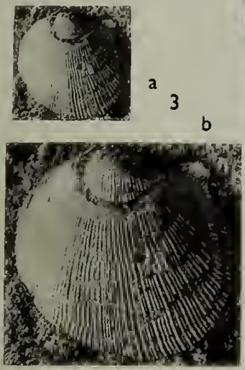
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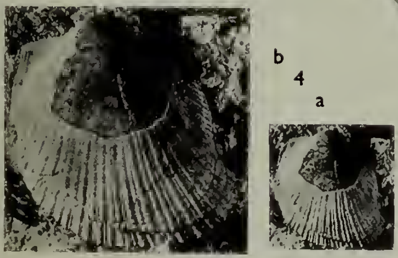
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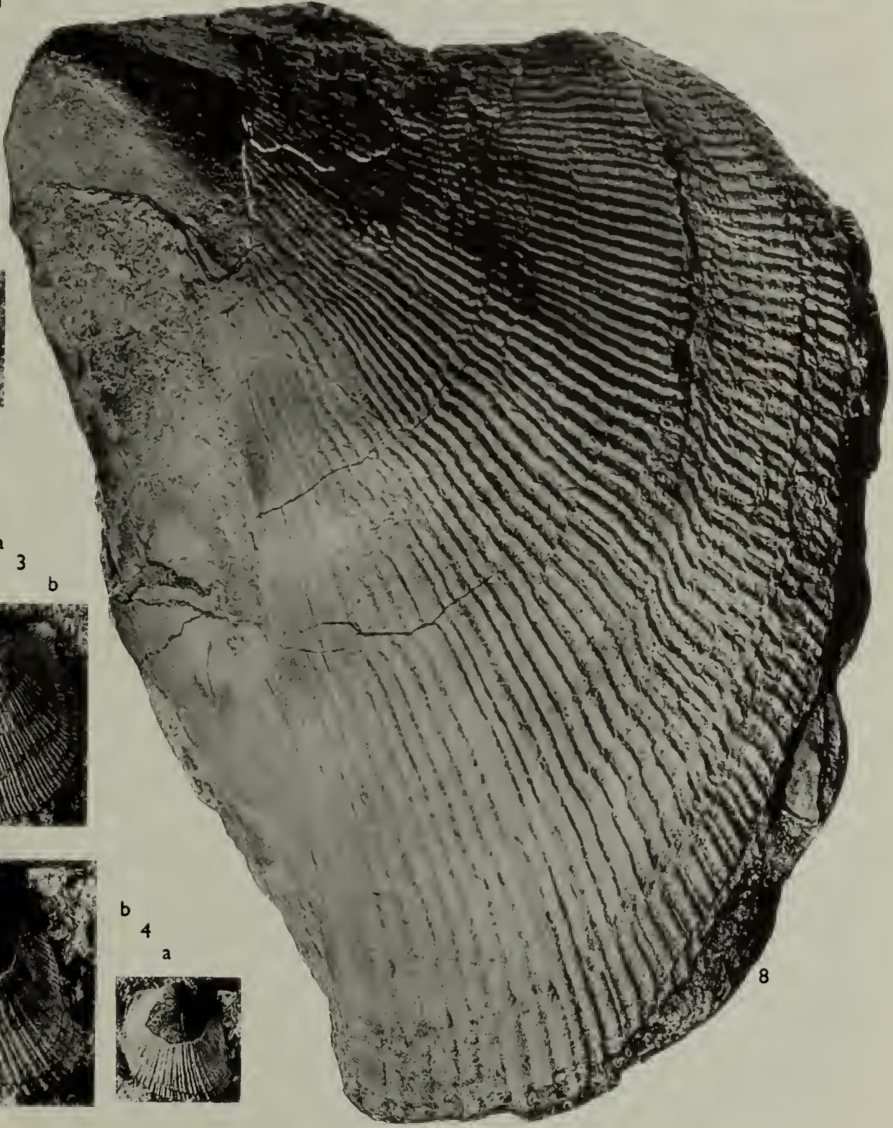
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PLATE 6

FIG. 1. *Bositra buchii* (Roemer). Lower Bajocian (Aalenian). Borehole at Lugoba, Tanganyika, L.82585, × 2 . . . . p. 50

FIG. 2. *Bositra somaliensis* (Cox). Upper Kimmeridgian, *Nerinella* Bed. Kindope, N.N.W. of Tendaguru, Tanganyika. L.51207, × 1 . . . . p. 50

FIG. 3. *Eopecten aubryi* (Douvillé). Callovian. Manyuli stream, just W. of Nautope, Tanganyika. Right valve, L.93550, × 1 . . . . p. 52

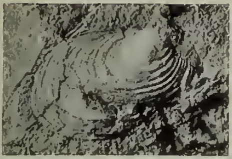
FIG. 4. Same species. Upper Oxfordian. Mandawa–Lonji creek traverse, Tanganyika. Left valve, LL.35199, × 1 . . . . p. 52

FIG. 5. *Entolium cingulatum* (Goldfuss). Upper Jurassic. 5 miles N.E. of Tengeni, N.E. Tanganyika. LL.35202, × 1 . . . . p. 52

FIG. 6. *Entolium briconense* (Cossmann). Callovian. 2½ miles N. of Msaka road junction, Bagamoyo district, Tanganyika. LL.35168, × 3 . . . . . . p. 51

FIG. 7. *Eopecten* aff. *albus* (Quenstedt). Upper Oxfordian, Seir Limestones. Wilderri hill, 11 miles S.S.W. of Rahmu, N.E. Kenya. Left valve, L.92247, × 1 . . . . p. 54

FIG. 8. *Eopecten thurmanni* (Brauns). Upper Oxfordian, Seir Limestones. 7 miles N.N.E. of Raiya hills. N.E. Kenya. Left valve, L.83900, × 1 . . . . . p. 53



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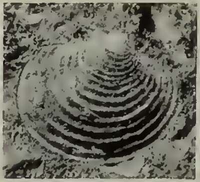

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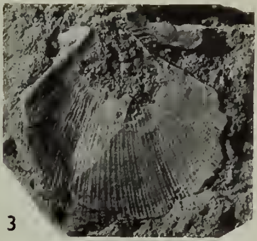

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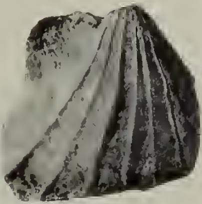

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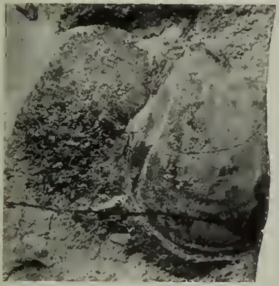

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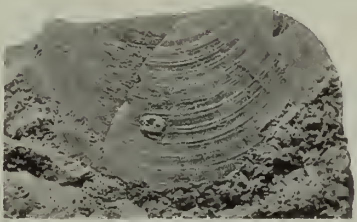

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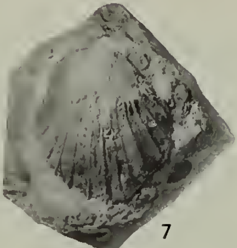

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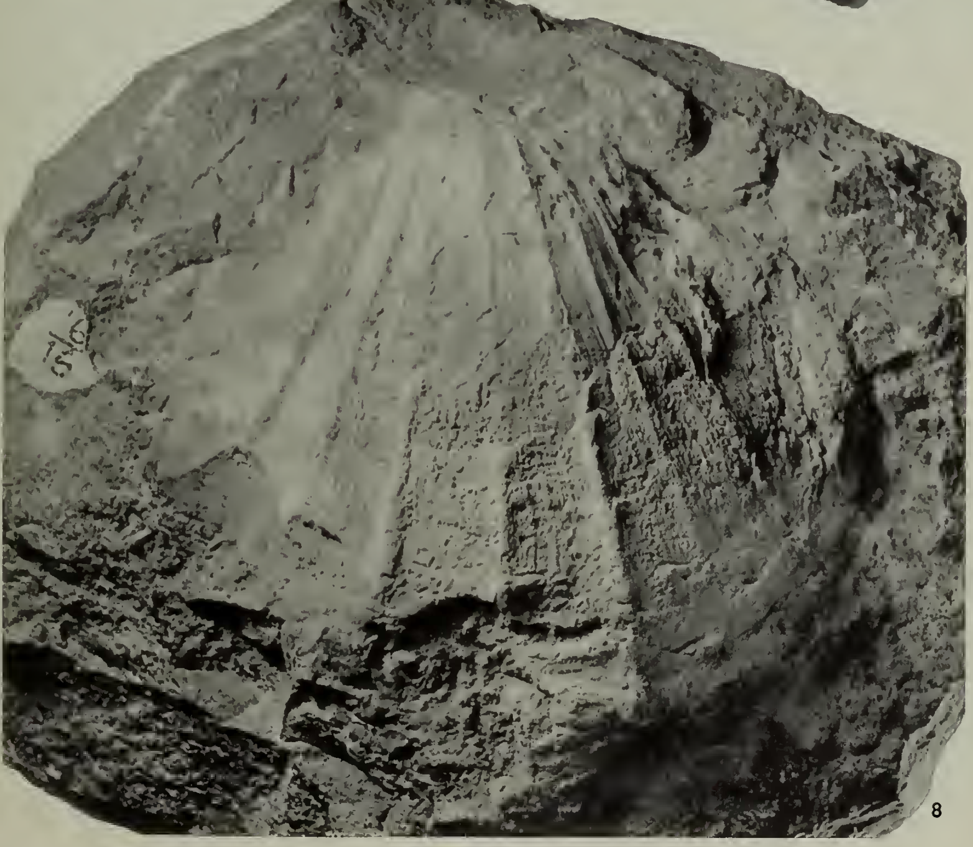

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PLATE 7

FIGS. 1*a*, *b*. *Chlamys matapwaensis* sp. nov. Upper Kimmeridgian. Just N. of Matapwa, Pindiro area, Tanganyika. Holotype, LL.35096 : *a*, × 1 ; *b*, × 3 . p. 56

FIGS. 2*a*, *b*. Same species, horizon and locality. Paratype, LL.35097 : *a*, × 1 ; b, × 2 . . . . p. 56

FIG. 3. *Chlamys* (*Spondylopecten ?*) *badiensis* Cox. Probably Callovian, Namakambe stream, Mandawa–Mahokondo anticline, Tanganyika. L.93552, × 1 . . . . p. 58

FIG. 4. Same species. Callovian. ½ mile N.W. of bridge over Mkulumuzi river, 2 miles W. of Tanga, Tanganyika. LL.35099, × 1 . . . . p. 58

FIG. 5. *Chlamys* (*Radulopecten*) *inaequicostata* (Young and Bird). Upper Oxfordian, Seir Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. L.92228, × 1 . p. 57

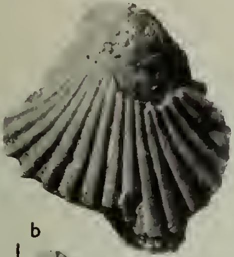
FIGS. 6*a*, *b*. *Chlamys* (*Radulopecten ?*) *kinjeleensis* sp. nov. Upper Kimmeridgian. Mpilepile stream bed, near Mitole, northern Mandawa area, Tanganyika. Paratype, LL.35098 : *a*, × 1 ; *b*, × 3 . . . . p. 57

FIGS. 7*a*, *b*. Same species. Upper Kimmeridgian, *Nerinella* Bed. N. of Kinjele, N.W. of Tendaguru, Tanganyika. Holotype, L.51955 : *a*, × 1 ; *b*, × 3 . . . . p. 57

FIG. 8. *Chlamys subtextoria* (Münster). Callovian. S. of Tarawanda, 11 miles S.E. of Lugoba, Tanganyika. L.54116, × 1 . . . . p. 55

FIGS. 9*a*, *b*, *c*. *Weyla ambongoensis* (Thevenin). Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. LL.35017 : *a*, left valve, × 1 ; *b*, right valve, × 1 ; *c*, ornament of ribs of right valve, × 3 . . . . p. 59

FIGS. 10*a*, *b*. *Lima* (*Plagiostoma*) *rahmuensis* sp. nov. Oxfordian, Rahmu Shales. 2½ miles S.W. of Rahmu, N.E. Kenya. Holotype, L.83892 : *a*, × 1 ; *b*, ornament, × 2·5 . . . . p. 61



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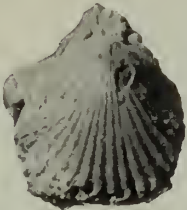

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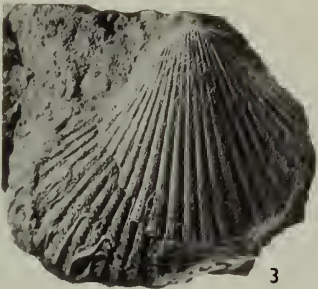

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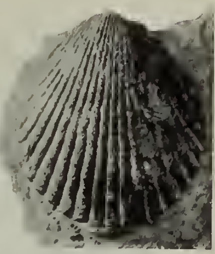

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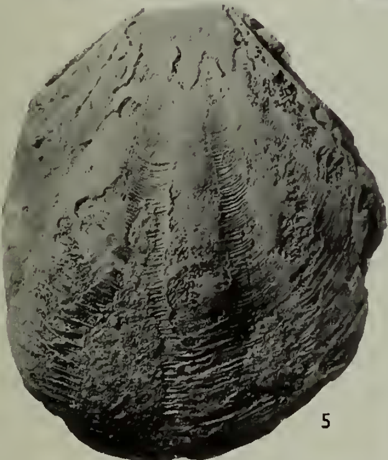

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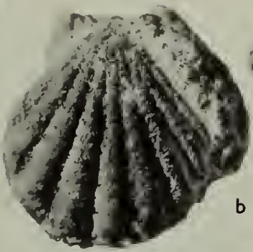

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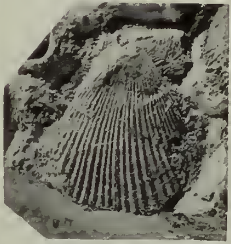

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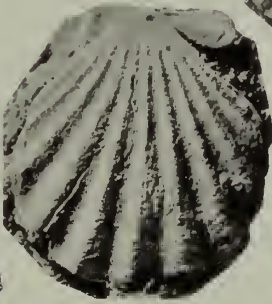

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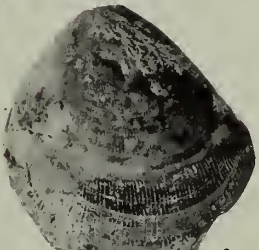

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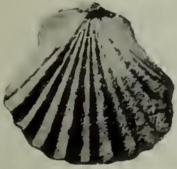

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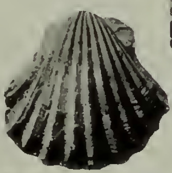

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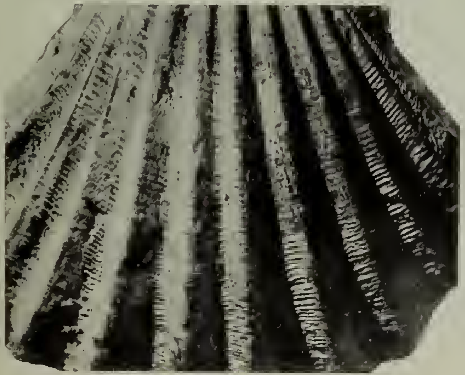

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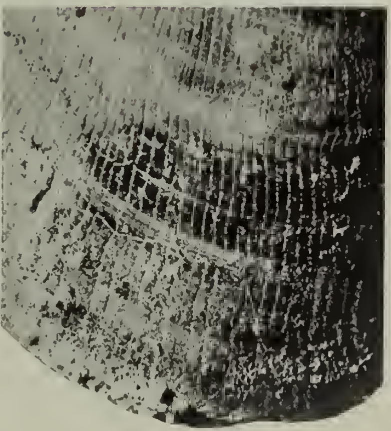


b

PLATE 8

FIG. 1. *Lima* (*Plagiostoma*) *biiniensis* sp. nov. Bathonian, Murri Limestones. 2 miles W. of Melka Biini, N.E. Kenya. Holotype, L.92174, × 1 . . . . . . p. 59

FIG. 2. *Lima* (*Plagiostoma*) *muddoensis* sp. nov. Callovian [?–Lower Oxfordian], Muddo Erri Limestones. Muddo Erri, 12 miles W. of Rahmu, N.E. Kenya. Holotype, L.92065, × 1 . . . . p. 60

FIG. 3. *Pseudolimea mandawaensis* sp. nov. Upper Oxfordian. Lihimaliao creek, Mandawa area, Tanganyika. Holotype, LL.35100, × 1 . . . . . . p. 64

FIGS. 4*a*, *b*. *Limatula migeodi* sp. nov. Upper Kimmeridgian, *Nerinella* Bed. Kindope, N.N.W. of Tendaguru, Tanganyika. Holotype, LL.11514 : *a*, × 1 ; *b*, × 3 . p. 65

FIG. 5. *Lima* (*Plagiostoma*) *sublaeviuscula* Krumbeck. Upper Kimmeridgian, Dakacha Limestones. 5 miles S. of Galgali Gambo, N.E. Kenya. L.83906, × 1 . . p. 62

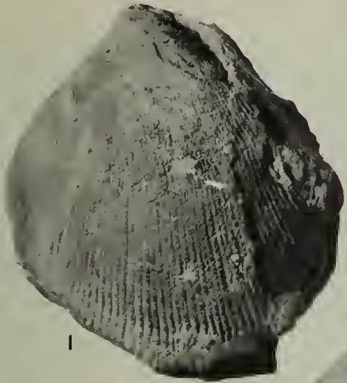
FIG. 6. Same species, horizon and locality. L.83905, × 1 . . . . . p. 62

FIGS. 7*a*, *b*. *Limatula moorei* sp. nov. Upper Oxfordian. Usigiwa river, 6 miles W.S.W. of Kiwanga, Tanganyika. Holotype, LL. 16799 : *a*, × 1 ; *b*, × 3 . p. 65

FIGS. 8*a*, *b*. *Pseudolimea duplicata* (J. de C. Sowerby). Upper Kimmeridgian, *Nerinella* Bed. Kindope, N.N.W. of Tendaguru, Tanganyika. LL.11323 : *a*, × 1 ; *b*, × 3 . . . . p. 64

FIG. 9. *Lima* (*Acesta*) *cutleri* sp. nov. Upper Kimmeridgian, "*Trigonia smeei*" Bed. Tingutitinguti creek, Tendaguru, Tanganyika. Holotype, L.52033, × 1 . . p. 63

FIG. 10. *Lima* (*Acesta*) *kindopeensis* sp. nov. Upper Kimmeridgian, *Nerinella* Bed. Kindope, N.N.W. of Tendaguru, Tanganyika. Holotype, L.56240, × 1 . . p. 62



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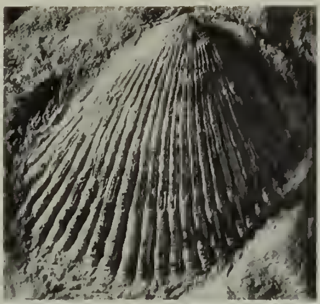

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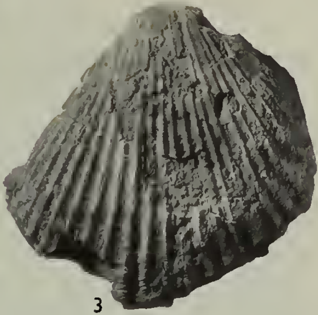

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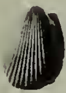

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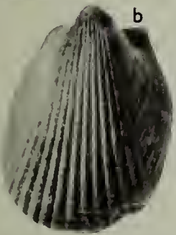

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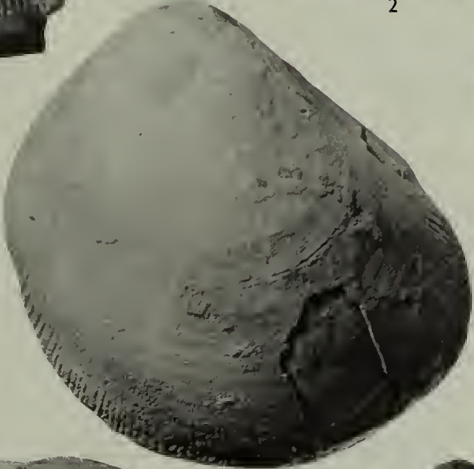

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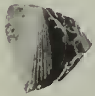

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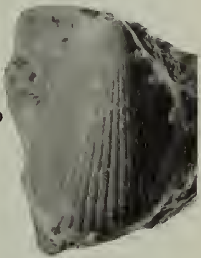

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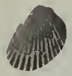

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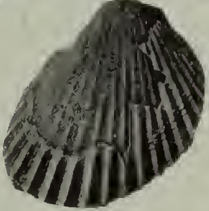

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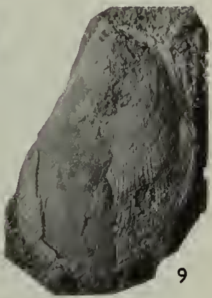

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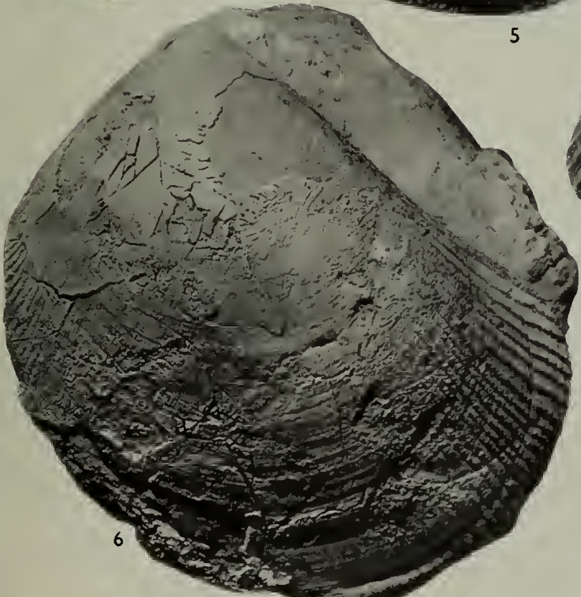

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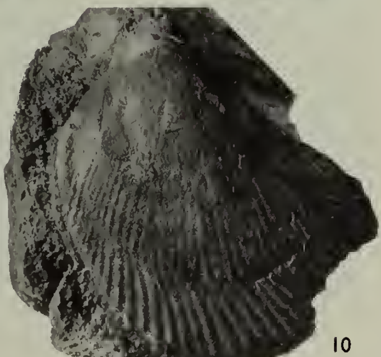

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PLATE 9

FIGS. 1*a*, *b*, *c*. *Lopha costata* (J. de C. Sowerby). Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. LL.35025 : *a*, left valve ; *b*, ventral view ; *c*, right valve, all × 1 . . . . p. 66

FIGS. 2*a*, *b*. *Lopha olimvallata* nom. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. LL.35026 : *a*, interior of left valve ; *b*, posterior side of left valve, attached to sheet of fibrous calcite, both × 1 . . . . . p. 68

FIG. 3. *Liostrea polymorpha* (Münster). Upper Oxfordian. Lihimaliao creek, Mandawa area, Tanganyika. Left valve, LL.35102, × 1 . . . . p. 72

FIG. 4. *Lopha solitaria* (J. de C. Sowerby). Upper Oxfordian, Seir Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. LL.92224, × 1 . . . . . . p. 69

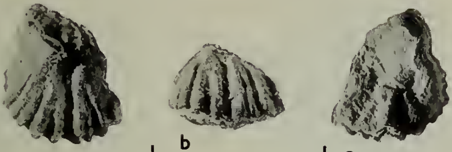
FIG. 5. *Lopha gregarea* (J. Sowerby). Upper Kimmeridgian, Dakacha Limestones. 3 miles N.E. of Melka Dakacha, N.E. Kenya. L.92179, × 1 . . . . . p. 68

FIGS. 6*a*, *b*. *Liostrea* (*Catinula*) *alimena* (d'Orbigny). Callovian [?–Lower Oxfordian], Muddo Erri Limestones. 10 miles W. of Rahmu, N.E. Kenya. L.92137 : *a*, left valve ; *b*, posterior view, both × 1 . . . . p. 72

FIGS. 7*a*, *b*. *Liostrea polymorpha* (Münster). Upper Oxfordian. Lihimaliao creek, Mandawa area, Tanganyika. LL.35103 : *a*, left valve, with second specimen broadly attached to it : *b*, right valve, both × 1 . . . . p. 72

FIGS. 8*a*, *b*. *Lopha* cf. *intricata* (Contejean). Oxfordian, Rahmu Shales. 6½ miles S.S.W. of Rahmu, N.E. Kenya. L.83899 : *a*, large attachment area of left valve ; *b*, right valve, both × 1 . . . . p. 69

PLATE 9



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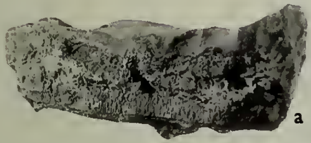

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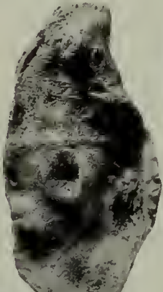

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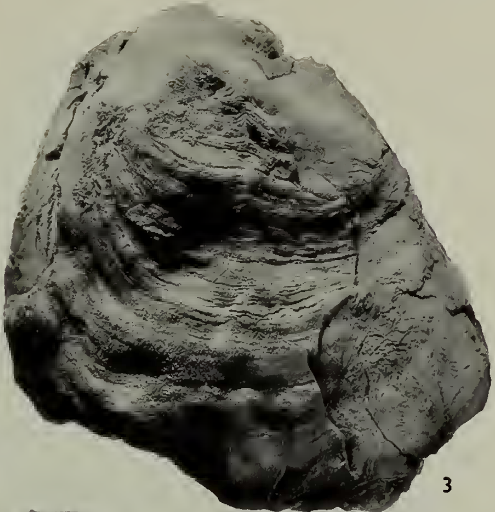

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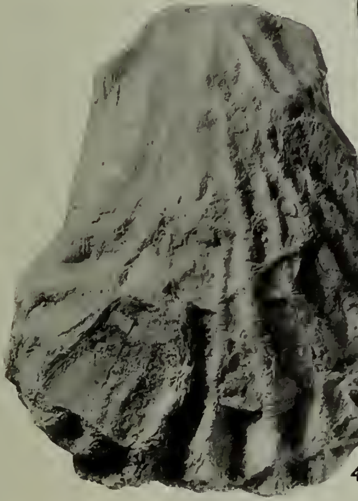

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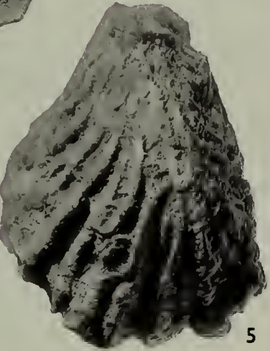

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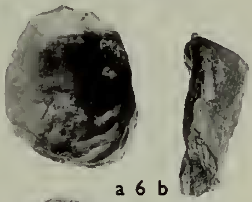
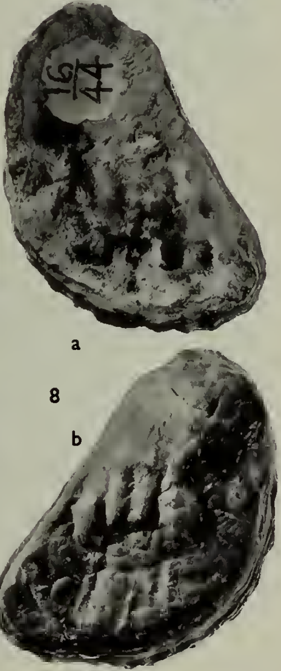


a 6 b



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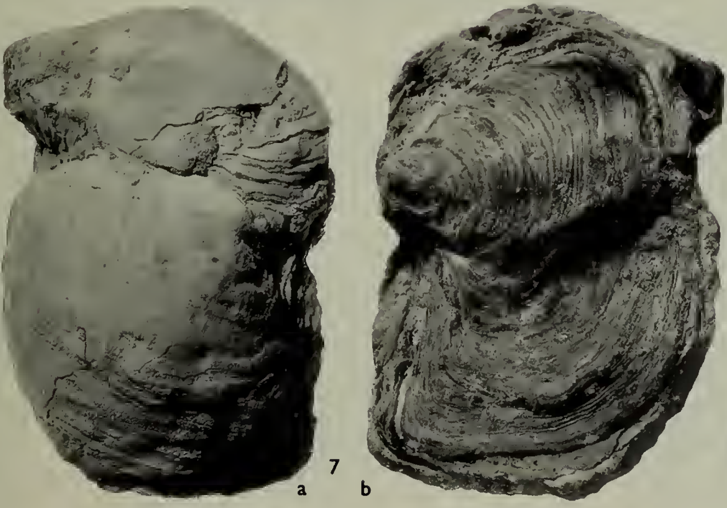


7 a b

PLATE 10

FIG. 1. *Lopha? tifoensis* sp. nov. Oxfordian, Golberobe Beds. Tifo, 14 miles N. of Wergudud, N.E. Kenya. Paratype, L.93561, × 1 . . . . p. 70

FIG. 2. Same species, horizon and locality. Paratype, L.93580, × 1 . . . p. 70

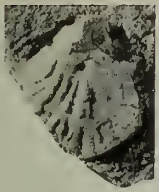
FIG. 3. *Lopha? kindopeensis* sp. nov. Upper Kimmeridgian, *Nerinella* Bed. Kindope, N.N.W. of Tendaguru, Tanganyika. Holotype, L.54855, interior of right valve, × 1 p. 70

FIGS. 4*a*, *b*. Same species, horizon and locality. Paratype, L.54858, ventral part of left valve : *a*, exterior ; *b*, interior, both × 1 . . . . p. 70

FIG. 5. Same species, horizon and locality. Paratype, L.54856, interior of right valve, × 1 . . . . p. 70

FIG. 6. *Lopha tifoensis* sp. nov. Oxfordian, Golberobe Beds. Tifo, 14 miles N. of Wergudud, N.E. Kenya. Holotype, L.93574, × 1 . . . . p. 70

FIG. 7. Same species, horizon and locality. Paratype, L.93563, × 1 . . . . p. 70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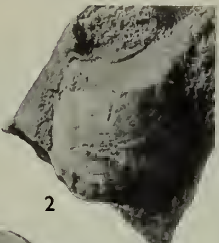
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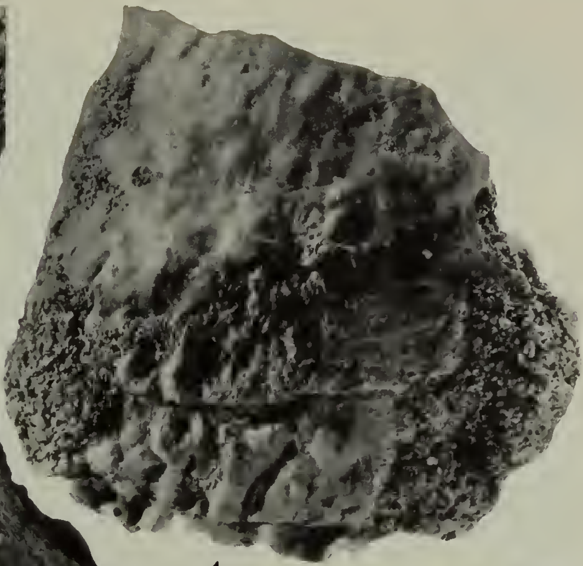
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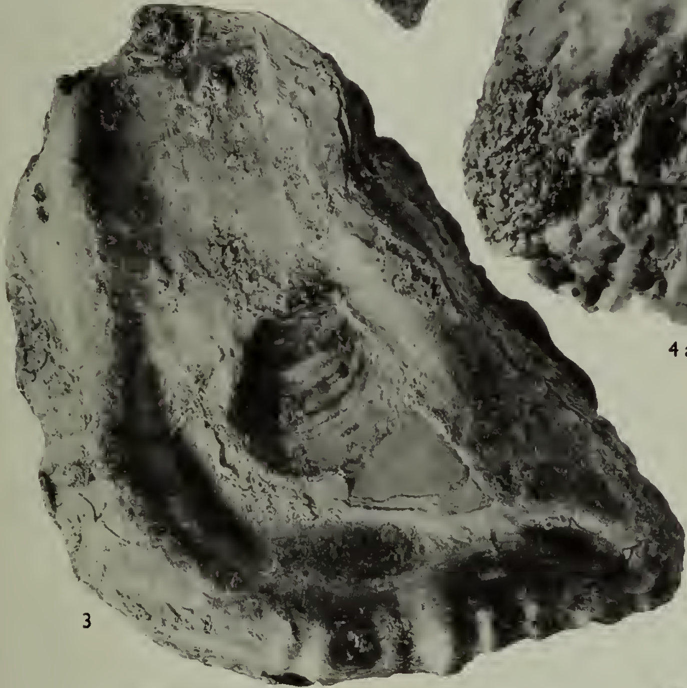
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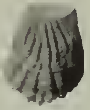
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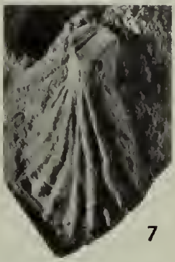
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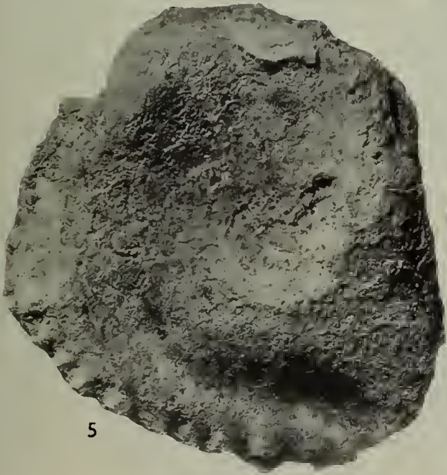
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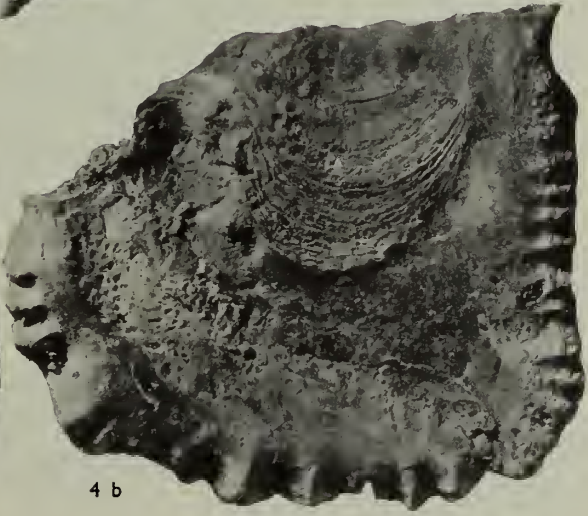
4 b

PLATE 11

FIGS. 1*a*, *b*. *Gryphaea hennigi* Dietrich. Upper Oxfordian. Hill opposite Kingura village, N. of Wami river, Bagamoyo hinterland, Tanganyika. LL.16848, × 1 . p. 73

FIGS. 2*a*, *b*. *Trigonia costata* Parkinson. Bajocian. Magole, 5 miles N.W. of Kidugallo, Tanganyika. LL.35104 : *a*, × 1 ; *b*, × 2 . . . . p. 74

FIGS. 3*a*, *b*, *c*. *Trigonia kidugalloensis* sp. nov. Bajocian. 1½ miles N.N.W. of Kidugallo, Tanganyika. Holotype, LL.35105 : *a*, *b*, side and dorsal views, × 1 ; *c*, side view, × 2 . . . . p. 75

FIGS. 4*a*, *b*, *c*. *Trigonia kenti* sp. nov. Bajocian. 6 miles N.W. of Kidugallo, Tanganyika. Holotype, LL.35107 : *a*, *b*, side and dorsal views, × 1 ; *c*, side view, × 2 . p. 75

FIG. 5. *Exogyra nana* (J. Sowerby). Oxfordian, Rahmu Shales. 2½ miles S.W. of Rahmu, N.E. Kenya. L.83889, × 1 . . . . p. 73

FIGS. 6*a*, *b*. Same species, horizon and locality. L.83891, × 1 . . . . p. 73

FIG. 7. *Trigonia* cf. *brevicostata* Kitchin. Bathonian [? or Callovian], Asaharbito Beds. 1 mile N. of Asaharbito, N.E. Kenya. LL.11380, × 1 . . . . . p. 76

FIG. 8. *Trigonia elongata* J. de C. Sowerby. Callovian ? 1½ miles W. of Mandawa, Tanganyika. LL.35109, × 1 . . . . p. 76

FIG. 9. *Trigonia dainellii* Venzo. Uppermost Jurassic or basal Cretaceous, Danissa Beds. W. slope of hill ½ mile E. of Hafura, N.E. Kenya. L.92270, × 1 . . . . p. 77

FIG. 10. *Trigonia* (*Frenguelliella*) *tealei* Cox. Callovian. S. of Tarawanda, 11 miles S.E. of Lugoba, Tanganyika. Holotype, L.54113, × 1 . . . . . . p. 78

FIGS. 11*a*, *b*. *Trigonia migeodi* sp. nov. Upper Kimmeridgian, *Nerinella* Bed. 1 mile N.W. of Tendaguru, Tanganyika. Holotype, L.51193 : *a*, × 1 ; *b*, × 2·4 . . p. 77

PLATE 11

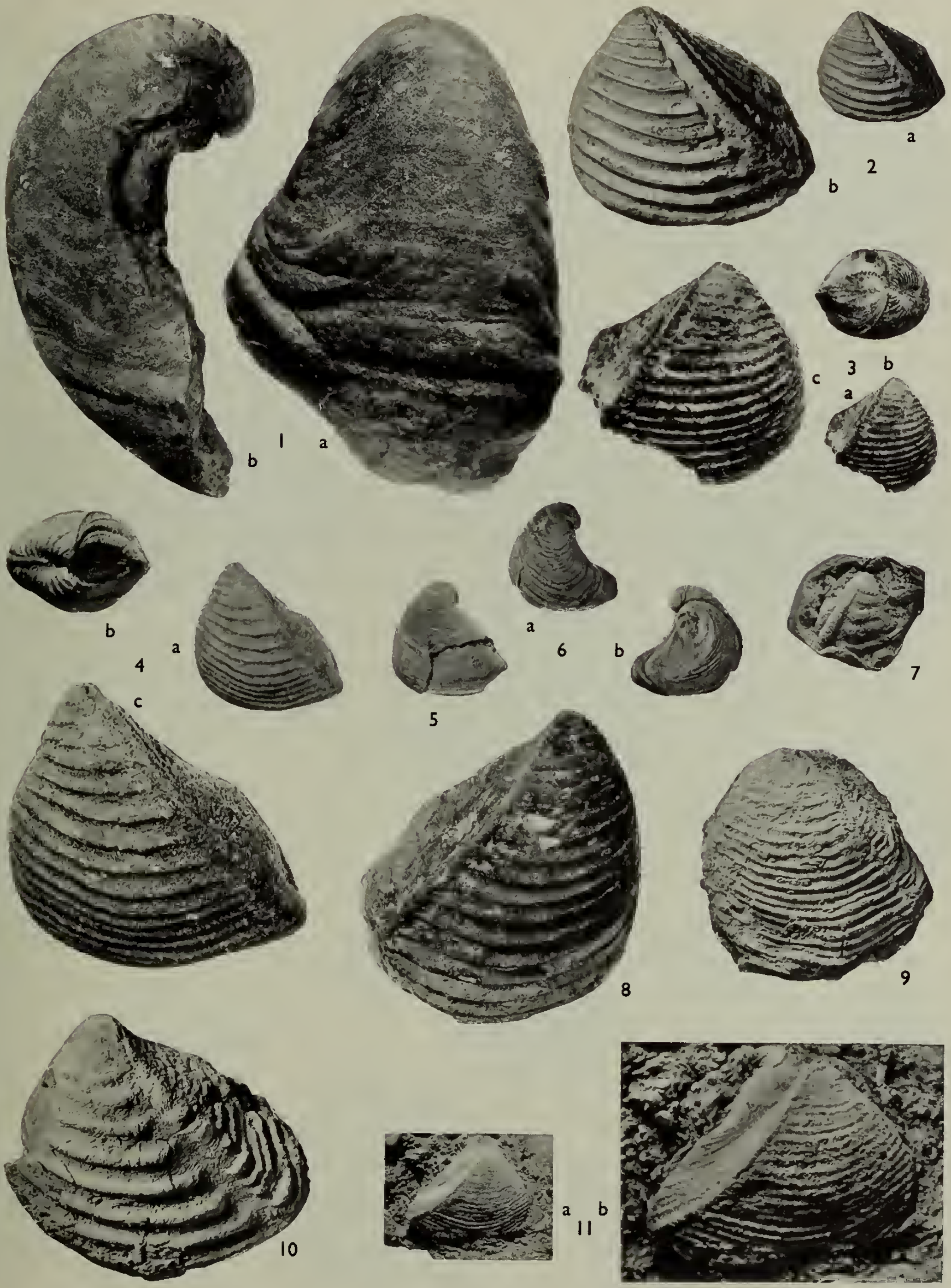

PLATE 12

FIGS. 1*a*, *b*. *Myophorella quennelli* sp. nov. Kimmeridgian. W. of Mabokweni, 4 miles N.W. of Tanga, Tanganyika. Holotype, LL.11809 : *a*, × 1 ; *b*, × 2 . p. 79

FIGS. 2*a*, *b*. *Myophorella kiwawaensis* sp. nov. Upper Kimmeridgian. Kiwawa stream, 2400 yards S.E. of Mitekera survey beacon, northern Mandawa area, Tanganyika. Holotype, LL.35110 : *a*, × 1 ; *b*, × 3 . . . . p. 80

FIGS. 3*a*, *b*. *Rutitrigonia stefaninii* (Venzo). Upper Kimmeridgian, Dakacha Limestones. 3 miles N.E. of Melka Dakacha, N.E. Kenya. L.92180 : *a*, × 1 ; *b*, × 2 p. 81

FIG. 4. *Opisthotrigonia curta* (Aitken). Upper Kimmeridgian. Mpilepile stream, 800 yards N.E. of Mitole road junction, northern Mandawa area, Tanganyika. LL.35112, × 1 . . . . p. 81

FIG. 5. *Laevitrigonia dwanikana* sp. nov. Upper Kimmeridgian, "*Trigonia smeei*" Bed. Dwanika river, N.E. of Tendaguru, Tanganyika. Holotype, L.52692, × 1 . p. 80

FIGS. 6*a*, *b*. *Astarte kenti* sp. nov. Bajocian (?), Pindiro Shales. Near site of Mandawa well no. 1, Tanganyika. Holotype, LL.35113 : *a*, × 1 ; *b*, × 2 . . . p. 85

FIGS. 7*a*, *b*. Same species, horizon and locality. Paratype, LL.35114 : *a*, × 1 ; *b*, × 2 . . . . p. 85

FIG. 8. *Astarte lurida* J. Sowerby. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. LL.35044, × 1 . . . . p. 82

FIGS. 9*a*, *b*, *c*. *Astarte aitkeni* sp. nov. Callovian. Nchia stream, 2 miles W.N.W. of Mandawa, Tanganyika. Holotype, LL.35189 : *a*, left valve, × 1 ; *b*, left valve, × 2 ; *c*, dorsal view, × 2 . . . . p 87

FIGS. 10*a*, *b*, *c*. *Astarte didimtuensis* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35032 : *a*, left valve, × 1 ; *b*, left valve, × 2 ; *c*, dorsal view, × 2 . . . . p. 84

FIGS. 11*a*, *b*, *c*. Same species, horizon and locality. Paratype, LL.35033 : *a*, right valve, × 1 ; *b*, right valve, × 2 ; *c*, dorsal view, × 2 . . . . . . p. 84

FIGS. 12*a*, *b*. *Astarte pulfreyi* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35027 : *a*, right valve ; *b*, dorsal view, both × 1 . . . . p. 83

FIG. 13. Same species, horizon and locality. Paratype, LL.35028, × 1 . . . p. 83

FIGS. 14*a*, *b*. *Astarte subminima* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35042 : *a*, × 1 ; *b*, × 3 . . . . p. 84

FIGS. 15*a*, *b*. *Astarte* sp. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. LL.35043 : *a*, × 1 ; *b*, × 3 . . . . p. 85

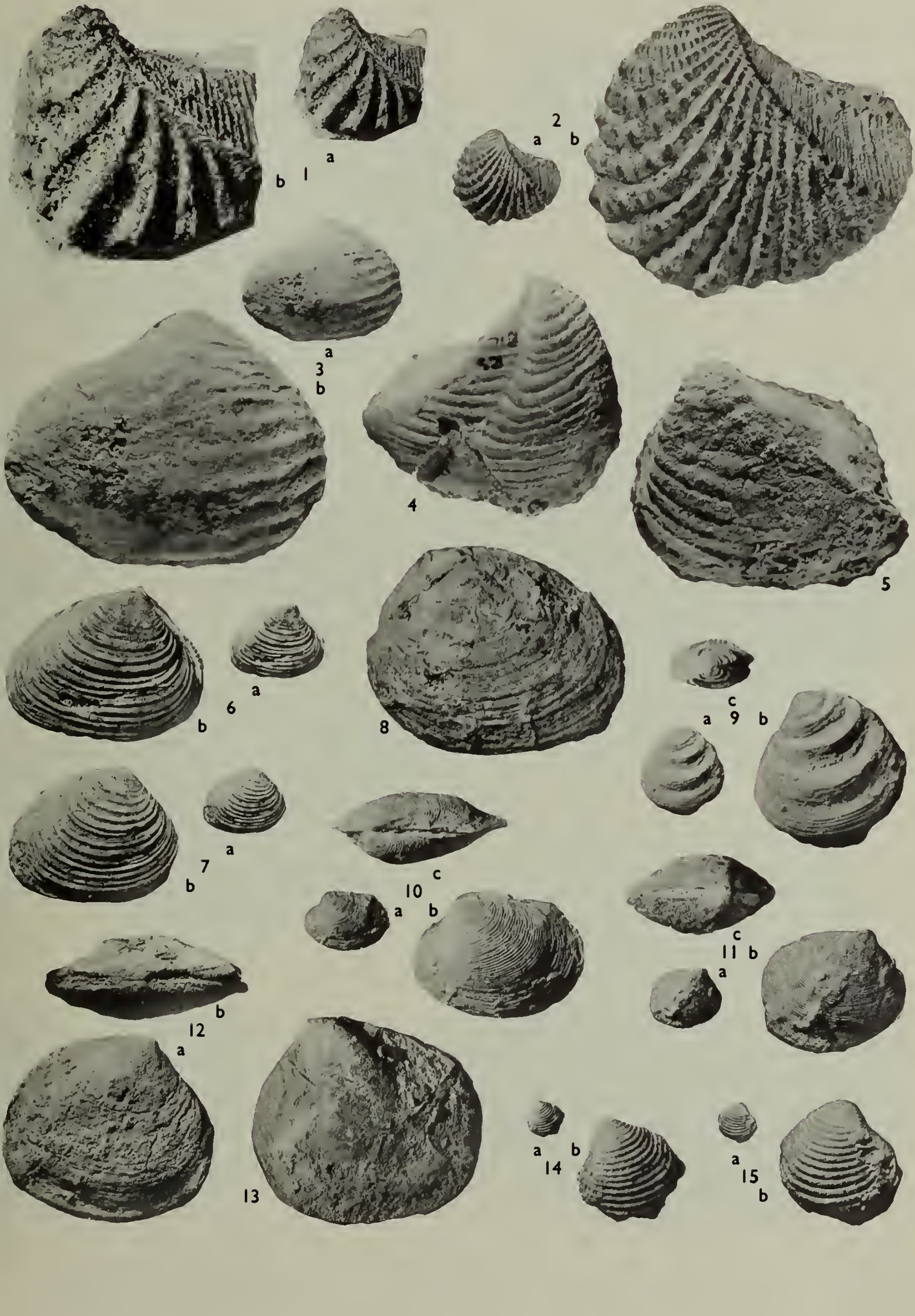
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PLATE 13

FIG. 1. *Astarte mitoleensis* sp. nov. Upper Kimmeridgian. Mpilepile stream, near Mitole, northern Mandawa area, Tanganyika. Holotype, LL.35123, × 1 . . . p. 92

FIG. 2. *Astarte weissermeli* Dietrich. Upper Kimmeridgian, "*Trigonia smeei*" Bed. Nitongola creek, Tendaguru, Tanganyika. L.52120, × 1 . . . . p. 92

FIG. 3. Same species. Upper Kimmeridgian. Mpilepile stream, near Mitole, northern Mandawa area, Tanganyika. LL.35204, × 1 . . . . p. 92

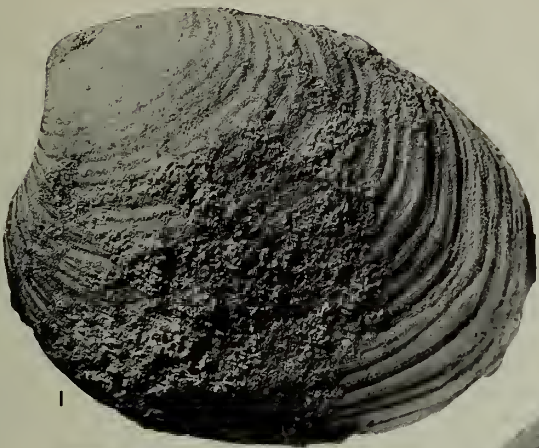
FIGS. 4*a*, *b*. *Astarte pindiroensis* sp. nov. Bajocian (?), Pindiro Shales. 1 mile S.E. of Nkomore, Mandawa–Mahokondo area, Tanganyika. Holotype, LL.35206 : *a*, × 1 ; *b*, × 4 . . . . p. 86

FIGS. 5*a*, *b*. Same species, horizon and locality. Paratype, LL.35207 : *a*, × 1 ; *b*, × 4 . . . . p. 86

FIGS. 6*a*, *b*. *Astarte sowerbyana* Holdhaus. Upper Oxfordian. Lihimaliao creek, Mandawa area, Tanganyika. LL.35120 : *a*, left valve ; *b*, dorsal view, both × 1 . p. 88

FIGS. 7*a*, *b*. *Astarte ayersi* sp. nov. Bathonian [? or Callovian], Asaharbito Beds. 1 mile N. of Asaharbito, N.E. Kenya. Holotype, L.83876 : *a*, × 1 ; *b*, × 2 . p. 86

FIG. 8. *Astarte episcopalis* de Loriol. Upper Oxfordian. Usigiwa river, 6 miles W.S.W. of Kiwangwa, Tanganyika. LL.16839, × 1 . . . . p. 88



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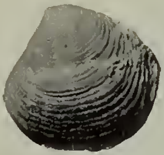

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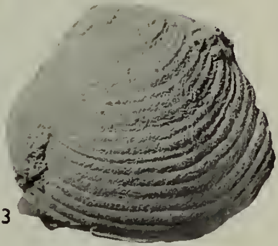

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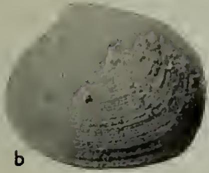

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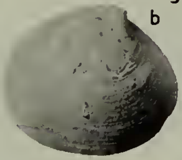

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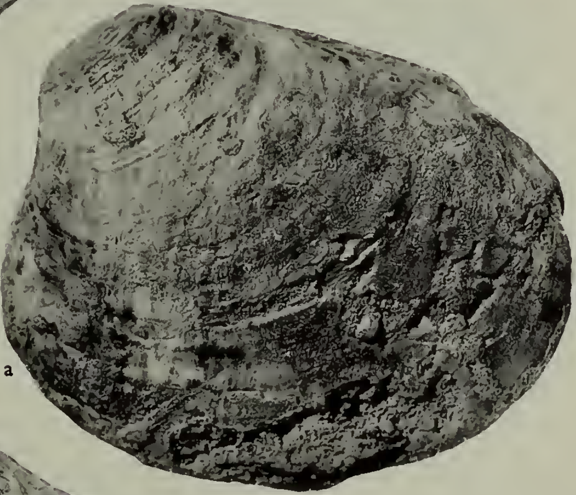

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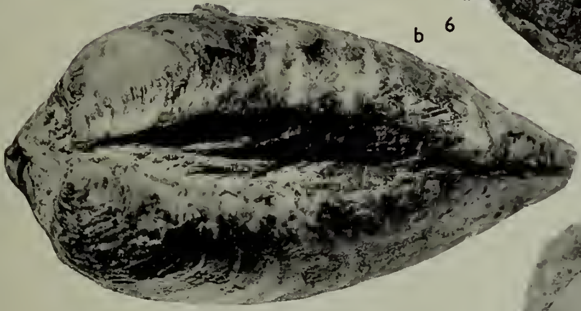

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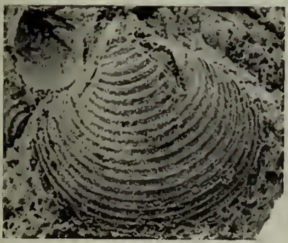

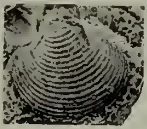

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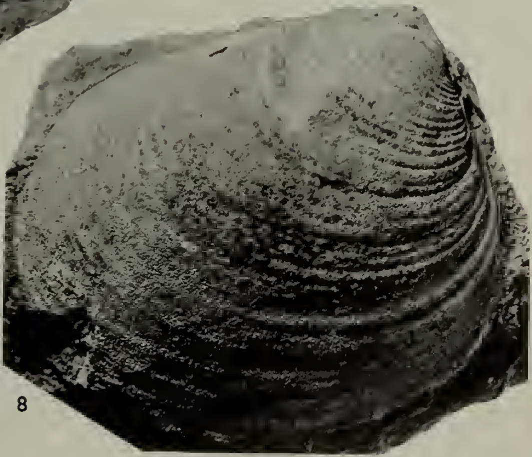

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PLATE 14

Fig. 1. *Astarte lonjiensis* sp. nov. Upper Kimmeridgian. Lonji creek, W. of Mandawa, Tanganyika. Holotype, LL.35122, × 1 . . . . p. 90

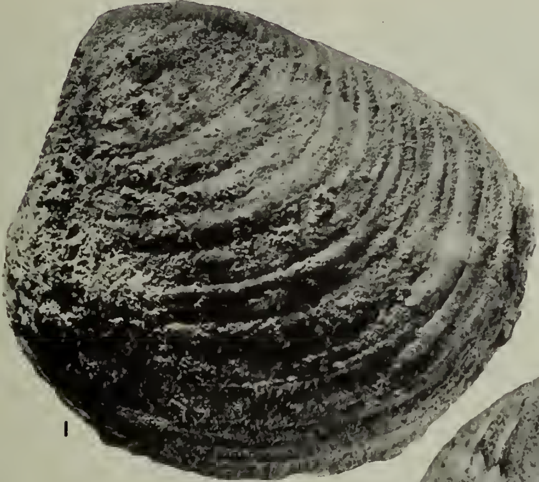
Fig. 2. *Astarte unilateralis* J. de C. Sowerby. Callovian ? Lonji creek, W. of Mandawa, Tanganyika. LL.35118, × 1 . . . . p. 87

Fig. 3. Same species, horizon and locality. LL.35119, × 1 . . . . . p. 87

Fig. 4. *Astarte recki* Dietrich. Upper Kimmeridgian, *Nerinella* Bed. Beyond N.W. flag, 1 mile N.W. of Tendaguru, Tanganyika. L.51186, × 1 . . . . . . p. 91

Fig. 5. Same species, horizon and locality. L.51188, × 1 . . . . . p. 91

Figs. 6*a*, *b*. *Astarte mandawaensis* sp. nov. Upper Kimmeridgian. Lonji creek, W. of Mandawa, Tanganyika. Holotype, LL.35121 : *a*, exterior ; *b*, hinge-teeth (left valve), both × 1 . . . . p. 90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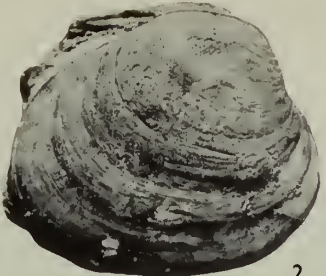
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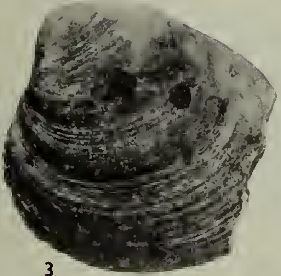
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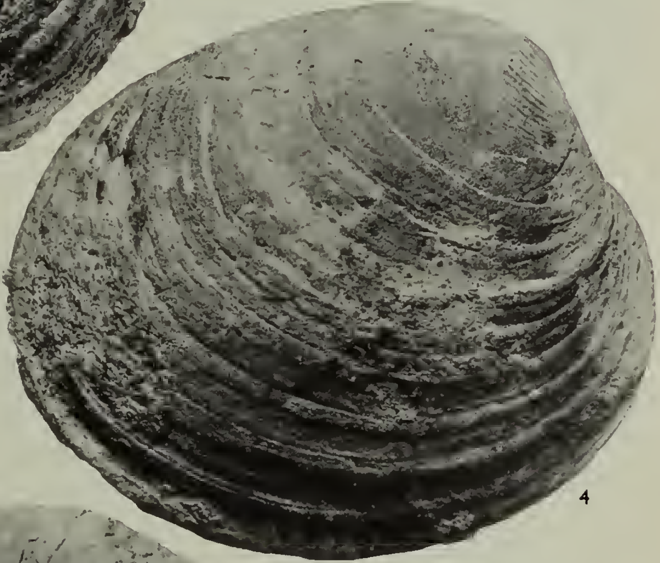
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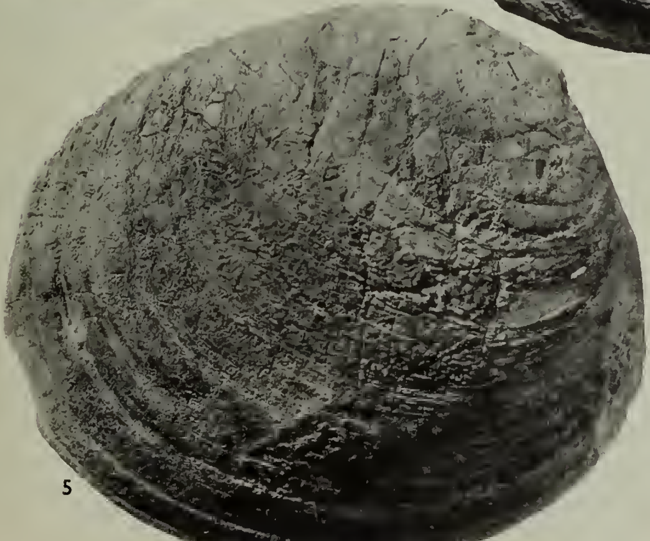
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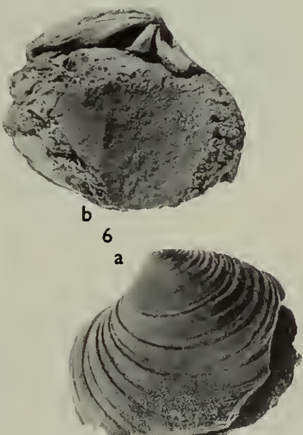

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PLATE 15

FIG. 1. *Astarte huralensis* Stefanini. Upper Oxfordian, Seir Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. L.92236, group of specimens, × 1 . . . p. 89

FIGS. 2*a*, *b*. *Astarte* (*Leckhamptonia*) *hobleyi* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35045 : *a*, × 1 ; *b*, × 1·6 . . . . p. 92

FIGS. 3*a*, *b*. *Lucina cutleri* sp. nov. Upper Kimmeridgian, "*Trigonia smeei*" Bed. Lilomba creek, Tendaguru, Tanganyika. Holotype, L.52141 : *a*, × 1 ; *b*, × 2 . p. 96

FIG. 4. *Astarte subobovata* Dietrich. Upper Kimmeridgian, "*Trigonia smeei*" Bed. Maimbwi river, S.E. of Tendaguru, Tanganyika. L.52683, × 1 . . . . . p. 91

FIGS. 5*a*, *b*. *Lucina* sp. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. LL.35047 : *a*, side view ; *b*, dorsal view, both × 1 . . . . p. 94

FIG. 6. *Fimbria* sp. "A". Callovian, Rukesa Shales. 13 miles W. of Rahmu, N.E. Kenya. L.92134, × 1 . . . . p. 98

FIG. 7. *Mactromya aequalis* Agassiz. Callovian [?–Lower Oxfordian]. Kulong, 2 miles S. of Muddo Erri, N.E. Kenya. L.92072, × 1 . . . . p. 97

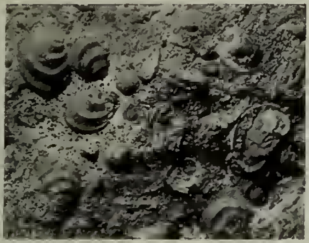
FIGS. 8*a*, *b*, *c*. *Mactromya eamesi* sp. nov. Bajocian (?), Pindiro Shales. Near side of Mandawa well no. 1, Tanganyika. Holotype, LL.35127 : *a*, left valve, × 1 ; *b*, left valve, × 2 ; *c*, dorsal view, × 1 . . . . p. 96

FIG. 9. *Lucina despecta* Phillips. Bajocian. 1¼ miles E. of Kidugallo Station, Tanganyika. L.54090, × 1·5 . . . . p. 95

FIG. 10. *Fimbria* sp. "C". Upper Kimmeridgian. Lonji creek, W. of Mandawa, Tanganyika. LL.35126, × 1 . . . . p. 100

FIGS. 11*a*, *b*. *Mactromya quadrata* (Roemer). Upper Oxfordian, Seir Limestones. 17 miles S. of Rahmu, N.E. Kenya. L.92218 : *a*, left valve (imperfect) ; *b*, dorsal view, both × 1 . . . . p. 97

FIG. 12. *Fimbria* sp. "B". Callovian [?–Lower Oxfordian], Muddo Erri Limestones. Muddo Erri, N.E. Kenya. L.92048, × 1 . . . . p. 99



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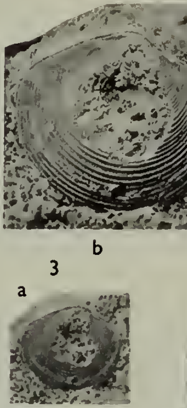

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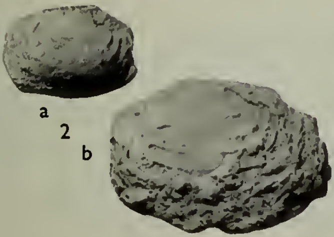

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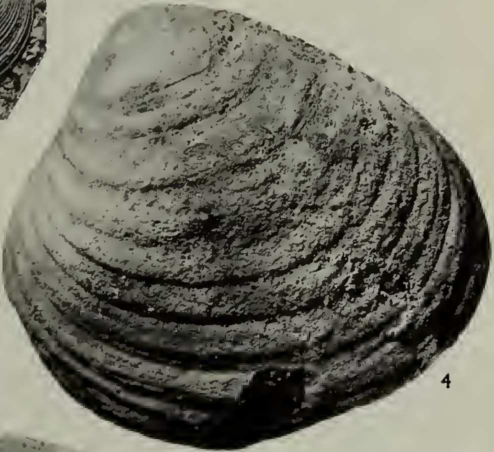

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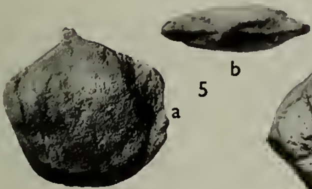

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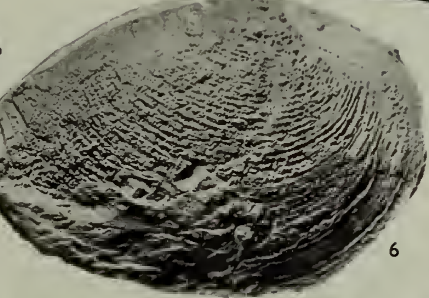

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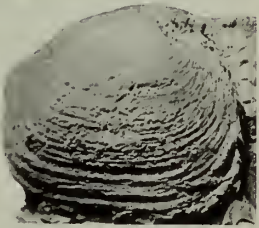

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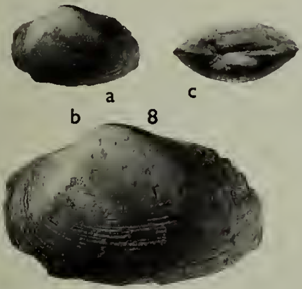

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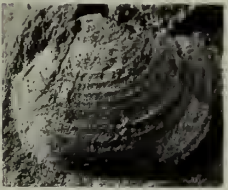

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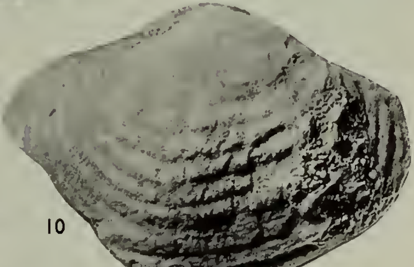

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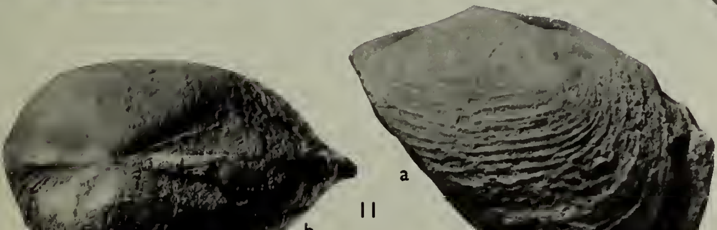

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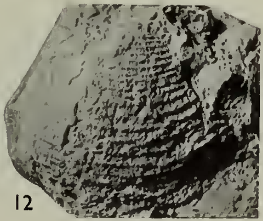

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PLATE 16

FIGS. 1*a*, *b*. *Fimbria kidugalloensis* sp. nov. Bajocian. 1¼ miles E. of Kidugallo Station, Tanganyika. Holotype, L.54103 : *a*, × 1 ; *b*, ornament, × 4·3 . . p. 98

FIGS. 2*a*, *b*, *c*. *Protocardia africana* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles. S. of Bur Mayo, N.E. Kenya. Holotype, LL.35603 : *a*, left valve, × 1 ; *b*, left valve, × 2 ; *c*, dorsal view, × 1 . . . . p. 101

FIG. 3. *Sphaeriola madridi* (d'Archiac). Bathonian [? or Callovian], Asaharbito Beds. 1 mile N. of Asaharbito, N.E. Kenya. L.83867, associated left and right valves, × 1 p. 101

FIG. 4. Same species, horizon and locality. L.83870, left valve, × 1 . . p. 101

FIG. 5. *Protocardia consobrina* (Terquem & Jourdy). Callovian. Changogo–Magindu track, 4 miles from Changogo town, Tanganyika. LL.35132, × 1 . . . p. 103

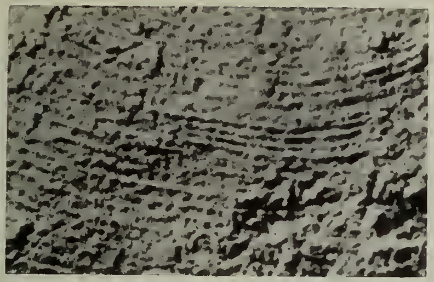
FIG. 6. *Protocardia* (*Tendagurium*) *propebanneiana* (Dietrich). Upper Kimmeridgian, "*Trigonia smeei*" Bed. Tingutitinguti creek, Tendaguru, Tanganyika. L.52084, × 1 p. 106

FIG. 7. *Fimbria quennelli* sp. nov. Upper Oxfordian. Usigiwa river, 6 miles W.S.W. of Kiwangwa, Tanganyika. Holotype, LL.16841, × 1 . . . . . . p. 99

FIG. 8. *Protocardia besairiei* sp. nov. Bajocian (?), Pindiro Shales. Lihimaliao creek, Mandawa area, Tanganyika. Holotype, LL.35128, × 1 . . . . . . p. 102

FIGS. 9*a*, *b*. Same species. Bajocian. Mont Bovy, Maevatanana, N.W. Madagascar. Paratype, L.74976 : *a*, right valve ; *b*, dorsal view, both × 1 . . . . p. 102

FIG. 10. Same species, horizon and locality. Paratype, L.74977, right valve, × 1 p. 102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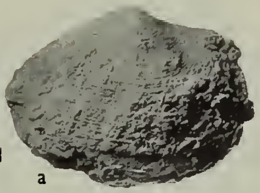
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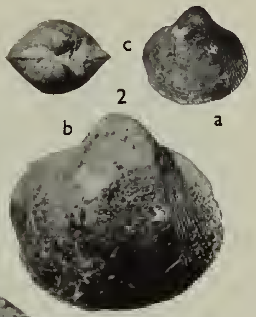

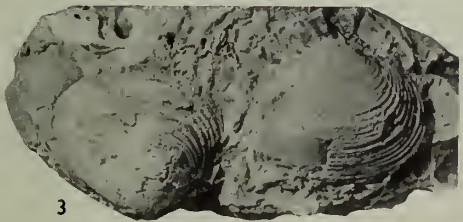
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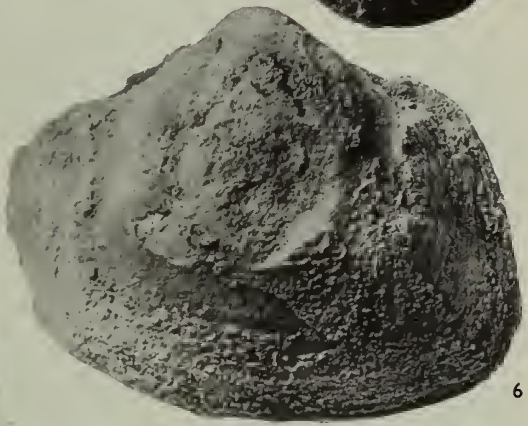
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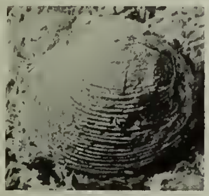
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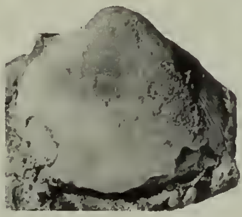
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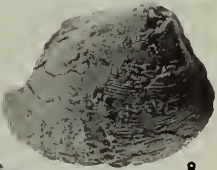
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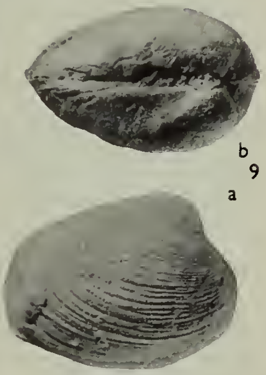

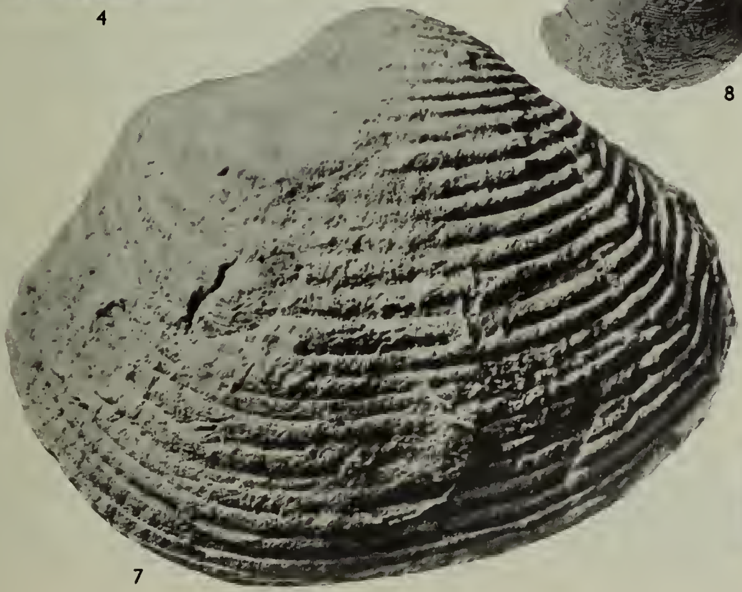
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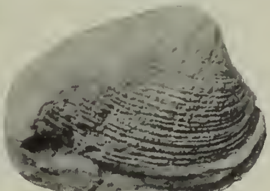
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PLATE 17

Fig. 1. *Protocardia bipi* sp. nov. Bajocian (?), Pindiro Shales. Lihimaliao creek, Mandawa area, Tanganyika. Paratype. LL.35130, × 1 . . . . p. 103

Fig. 2. Same species, horizon and locality. Paratype, LL. 35131, × 1 . . . p. 103

Figs. 3*a*, *b*. Same species, horizon and locality. Holotype, LL.35129 : *a*, left valve ; *b*, dorsal view, both × 1 . . . . p. 103

Figs. 4*a*, *b*. *Protocardia rahmuensis* sp. nov. Oxfordian, Rahmu Shales. 5½ miles S.W. of Rahmu, N.E. Kenya. Holotype, L.92257 : *a*, × 1 ; *b*, × 2·2 . . . . p. 104

Figs. 5*a*, *b*. *Protocardia schencki* Müller. Upper Kimmeridgian, " *Trigonia smeei* " Bed. Tingutitinguti creek, Tendaguru, Tanganyika. L.52038 : *a*, × 1; *b*, × 2 . . . p. 104

Fig. 6. *Protocardia suprajurensis* (Contejean). Upper Kimmeridgian. N. of Matapwa, Pindiro area, Tanganyika. LL.35134, × 1·1 . . . . p. 105

Fig. 7. *Ceratomyopsis basochiana* (Defrance). Callovian. 2 miles E. of Magindu Station, Tanganyika. L.67164, × 1 . . . . p. 106

Figs. 8*a*, *b*. Same species. Callovian [?–Lower Oxfordian], Muddo Erri Limestones. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya. L.92082 : *a*, left valve ; *b*, posterior end, both × 1 . . . . p. 106

Fig. 9. *Ceratomyopsis striata* (d'Orbigny). Kimmeridgian, Hereri Shales. Hereri river crossing, 3 miles S. of Melka Kunha, N.E. Kenya. L.92191, × 1 . . . . p. 107

Fig. 10. *Pronoella putealis* sp. nov. Bajocian (?), Pindiro Shales. Lihimaliao creek, Mandawa area, Tanganyika. Paratype, LL.35142, × 1·5 . . . . . . p. 109

Fig. 11. Same species, horizon and locality. Holotype, LL.35141, × 1·5 . . p. 109

Fig. 12. *Pronoella pindiroensis* sp. nov. Bajocian (?), Pindiro Shales. Lihimaliao creek, Pindiro area, Tanganyika. Paratype, LL.35159 ; hinge-teeth of right valve, × 1 p. 108

Fig. 13. Same species and horizon. Near site of Mandawa well no. 1, Tanganyika. Paratype, LL.35138, × 1 . . . . p. 108

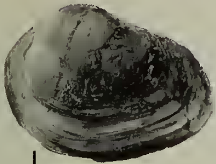
Figs. 14*a*, *b*. Same species, horizon and locality. Holotype, LL.35135 : *a*, right valve ; *b*, dorsal view, both × 1 . . . . p. 108

Fig. 15. Same species, horizon and locality. Paratype, LL.35136, × 1 . . . p. 108

Fig. 16. Same species and horizon. Lihimaliao creek, Pindiro area, Tanganyika. Paratype, LL.35140, × 1 . . . . p. 108

Figs. 17*a*, *b*. Same species and horizon. Near site of Mandawa well no. 1, Tanganyika. Paratype, LL.35137 : *a*, right valve ; *b*, dorsal view, both × 1 . . . . p. 108

PLATE 17



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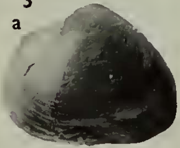

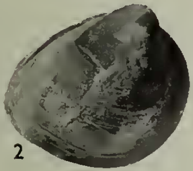

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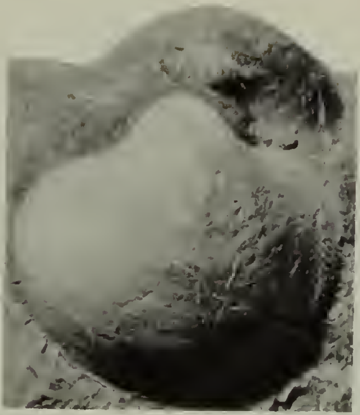

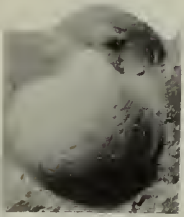

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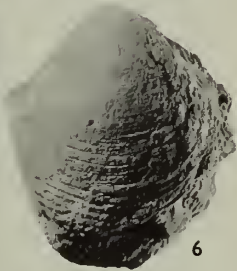

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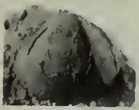

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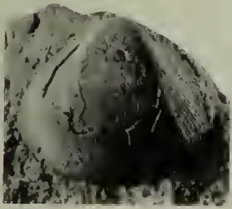

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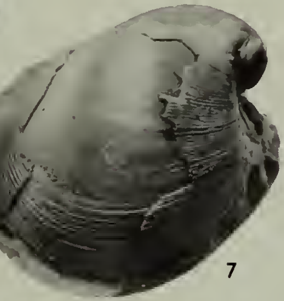

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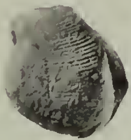

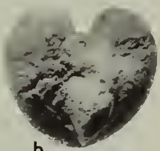

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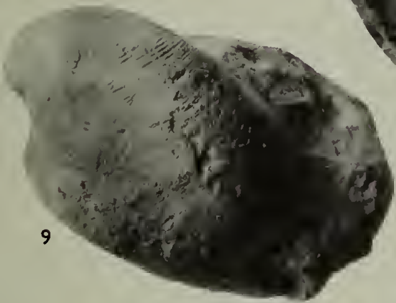

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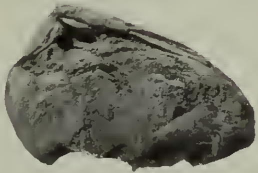

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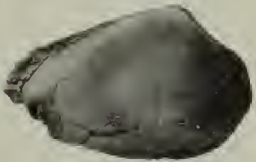

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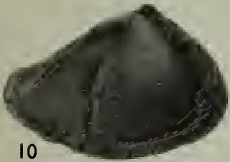

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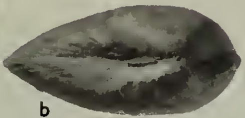

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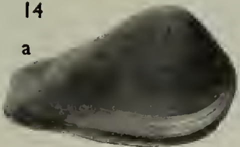

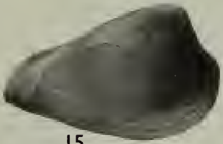

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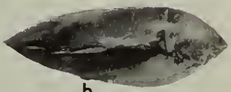

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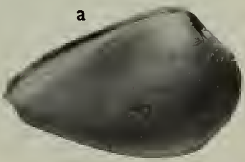

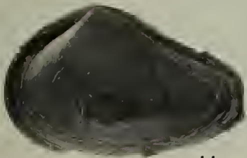

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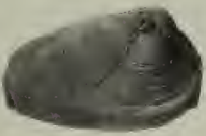

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PLATE 18

FIGS. 1*a*, *b*. *Pronoella kidugalloensis* sp. nov. Bajocian. 1½ miles N.N.W. of Kidugallo, Tanganyika. Holotype, LL.35143 : *a*, right valve ; *b*, dorsal view, both × 1 . p. 109

FIGS. 2*a*, *b*. *Eotrapezium? thompsoni* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35061 : *a*, right valve ; *b*, dorsal view, both × 1 . . . . p. 113

FIG. 3. *Anisocardia kinjeleensis* sp. nov. Upper Kimmeridgian. Kinjele, 5 miles W. of Mtapaia, Tanganyika. Holotype, L.51938, × 1 . . . . p. 112

FIG. 4. *Anisocardia didimtuensis* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35056, × 1 . . . . p. 110

FIGS. 5*a*, *b*. *Anisocardia arkelli* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35051 : *a*, left valve ; *b*, dorsal view, both × 1 p. 110

FIGS. 6*a*, *b*. *Anisocardia ayersi* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35057 : *a*, right side ; *b*, dorsal view, both × 1 . . . . p. 111

FIGS. 7*a*, *b*. *Eotrapezium? africanum* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35058 : *a*, right side of internal mould ; *b*, dorsal view, both × 1 . . . . p. 112

FIG. 8. *Anisocardia minima* (J. Sowerby). Callovian, Rukesa Shales. 13 miles W. of Rahmu, N.E. Kenya. L.92120, × 1 . . . . p. 112

FIGS. 9*a*, *b*. *Eotrapezium? kenti* sp. nov. Bajocian. 5 miles N.W. of Kidugallo, Tanganyika. Holotype, a left valve, LL.35144 : *a*, exterior ; *b*, hinge-teeth, both × 1 p. 113

FIGS. 10*a*, *b*. Same species, horizon and locality. Paratype, LL.35145 : *a*, right valve : *b*, dorsal view, both × 1 . . . . p. 113

FIG. 11. *Eomiodon baroni* (Newton). Bajocian (?). 1 mile N.N.E. of Ngerengere, Tanganyika. LL.7210, × 1 . . . . p. 114

FIGS. 12*a*, *b*. *Eomiodon tanganyicensis* sp. nov. Bajocian (?). 1 mile N.N.E. of Ngerengere, Tanganyika. Holotype, a right valve, LL.7215 : *a*, exterior ; *b*, interior, both × 1 . . . . p. 115

FIG. 13. Same species, horizon and locality. Paratype, LL.7214, × 1 . . . p. 115

FIGS. 14*a*, *b*. *Eomiodon namgaruensis* sp. nov. Jurassic. 1 mile E.S.E. of Uleka, Marudyi–Namgaru area, Tanganyika. Holotype, LL.35146 : *a*, right valve ; *b*, dorsal view, both × 1 . . . . p. 116

FIGS. 15*a*, *b*. *Eomiodon dinosaurianum* sp. nov. Upper Kimmeridgian. Tendaguru, Tanganyika. Paratype, L.53323 : *a*, × 1 ; *b*, × 3 . . . . p. 116

FIGS. 16*a*, *b*. Same species, horizon and locality. Holotype, L.53322 : *a*, × 1 ; *b*, × 3 . . . . p. 116

FIG. 17. *Eomiodon* (*Africomiodon*) *cutleri* sp. nov. Upper Kimmeridgian, "*Trigonia smeei*" Bed. Tingutitinguti creek, Tendaguru, Tanganyika. Paratype, L.51998, hinge-teeth of left valve, × 2 . . . . p. 117

FIGS. 18*a*, *b*. Same species, horizon and locality. Holotype, a right valve, L.51995 : *a*, exterior. × 1 ; *b*, interior, × 2 . . . . p. 117

PLATE 18

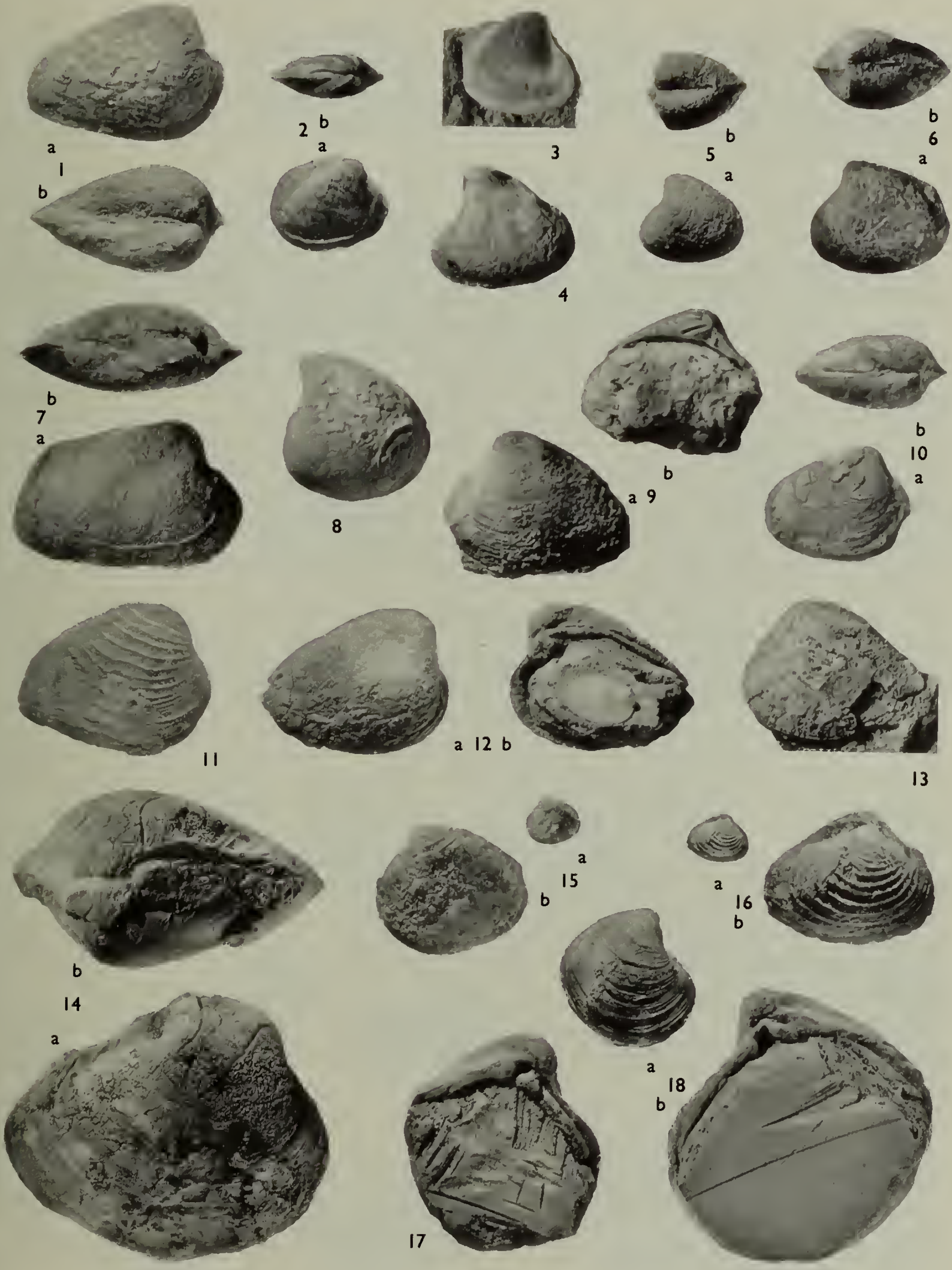
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PLATE 19

FIG. 1. *Tancredia manderaensis* sp. nov. Uppermost Jurassic, Gudediye Beds. Matasafara, 15 miles W. of Mandera, N.E. Kenya. Latex "squeeze" from holotype, LL.35190, × 1 . . . p. 119

FIG. 2. *Tancredia* sp. "A". Oxfordian, Golberobe Beds. Korkai Hammassa, 19 miles E. of Takabba, N.E. Kenya. L.93625, × 1 . . . p. 118

FIG. 3. *Tancredia* sp. "B". Oxfordian, Golberobe Beds. Ogar Wein, 17 miles N.W. of Wergudud, N.E. Kenya. L.93614, × 1 . . . p. 118

FIG. 4. *Quenstedtia saggersoni* sp. nov. Oxfordian, Golberobe Beds. Ogar Wein, 17 miles N.W. of Wergudud, N.E. Kenya. Holotype, L.93600, × 1 . . . p. 119

FIG. 5. *Quenstedtia jouberti* sp. nov. Upper Kimmeridgian, Dakacha Limestones. N. of Figfirya, northern Raiya hills, N.E. Kenya. Holotype, L.92213, × 1 . . . p. 120

FIG. 6. *Quenstedtia saggersoni* sp. nov. Oxfordian, Golberobe Beds. Korkai Hammassa, 19 miles E. of Takabba, N.E. Kenya. Paratype, L.93636, × 1 . . . p. 119

FIGS. 7*a*, *b*. *Corbula mandawaensis* sp. nov. Bajocian (?). Depth 48–50 feet, Mandawa well no. 6, Tanganyika. Paratype, LL.35149, a right valve : *a*, × 1 ; *b*, × 4 . p. 121

FIGS. 8*a*, *b*. Same species. Bajocian (?). Depth 46–48 feet, Mandawa well no. 6, Tanganyika. Holotype, LL.35148, a left valve : *a*, × 1 ; *b*, × 4 . . . p. 121

FIGS, 9*a*, *b*. *Corbula tanganyicensis* sp. nov. Bajocian (?). Depth 4510–4520 feet, Mandawa well no. 7, Tanganyika. Paratype, LL.35151 : *a*, × 1 ; *b*, × 5 . . p. 122

FIG. 10. *Corbula didimtuensis* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Paratype, LL.35074, × 1 . . . p. 120

FIGS. 11*a*, *b*, *c*. Same species, horizon and locality. Holotype, LL.35073 : *a*, left valve ; *b*, right valve ; *c*, dorsal view, all × 1 . . . p. 120

FIGS. 12*a*, *b*, *c*, *d*. *Corbula tanganyicensis* sp. nov. Bajocian (?). Depth 4510–4520 feet, Mandawa well no. 7, Tanganyika. Holotype, LL.35150 : *a*, × 1 ; *b*, left valve, × 5 ; *c*, dorsal view, × 5 ; *d*, right valve, × 5 . . . p. 122

FIGS. 13*a*, *b*. *Corbula kailtaensis* sp. nov. Oxfordian, Golberobe Beds. Kailta, Golberobe hills, N.E. Kenya. Holotype, L.92036 : *a*, × 1 ; *b*, × 2 . . . p. 125

FIGS. 14*a*, *b*, *c*. *Corbula pindiroensis* sp. nov. Bajocian (?). Depth 166–170 feet, Pindiro well no. 1, Tanganyika. Holotype, LL.35152 : *a*, right valve, × 1 ; *b*, right valve, × 2 ; *c*, left valve, × 2 . . . p. 122

FIGS. 15*a*, *b*. Same species. Bajocian (?). Depth 170–174 feet, Pindiro well no. 1, Tanganyika. Paratype, LL.35153 : *a*, left valve, × 1 ; *b*, left valve, × 2 . . p. 122

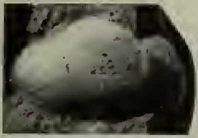
FIG. 16. *Pleuromya didimtuensis* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, LL.35079, × 1 . . . p. 131

FIGS. 17*a*, *b*, *c*. *Corbula kidugalloensis* sp. nov. Bajocian. 5 miles N.W. of Kidugallo, Tanganyika. Holotype, LL.35154 : *a*, left valve, × 1 ; *b*, left valve, × 2 ; *c*, dorsal view, × 2 . . . p. 123

FIGS. 18*a*, *b*. *Corbula asaharbitensis* sp. nov. Bathonian [? or Callovian], Asaharbito Beds. 1 mile N. of Asaharbito, N.E. Kenya. Holotype, LL.13230, a left valve : *a*, × 1 ; *b*, × 5 . . . p. 124

FIGS. 19*a*, *b*, *c*. *Corbula eamesi* sp. nov. Bajocian. 6 miles N.W. of Kidugallo, Tanganyika. Holotype, LL.35155 : *a*, left valve, × 1 ; *b*, left valve, × 2 ; *c*, dorsal view, × 2 . . . p. 123

FIG. 20. *Myopholas manderaensis* sp. nov. Uppermost Jurassic, Gudediye Beds. Matasafara, 15 miles W. of Mandera, N.E. Kenya. Holotype, L. 92271, × 1 . . p. 130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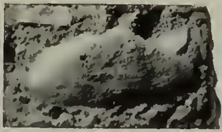
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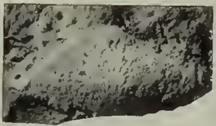
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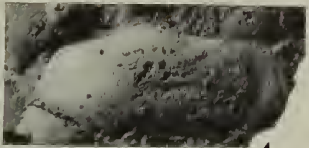
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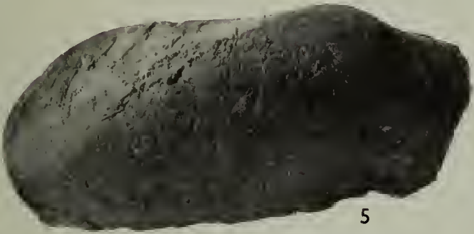
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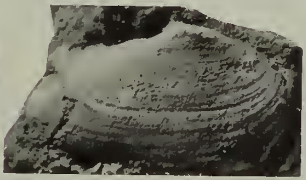
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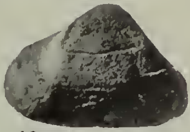
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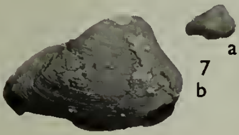
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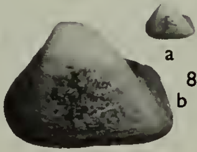
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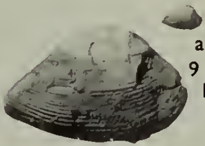
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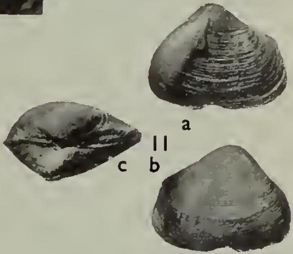
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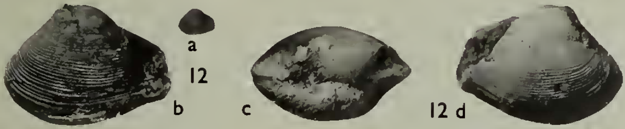
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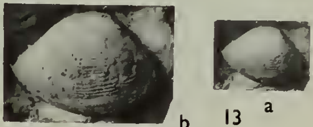
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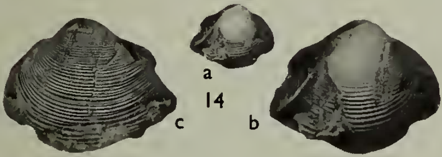
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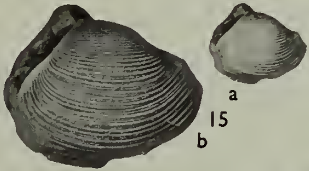
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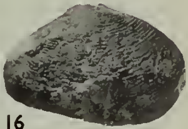
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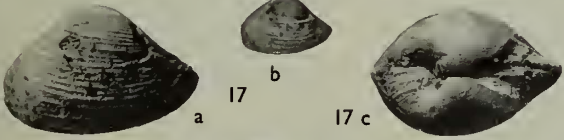
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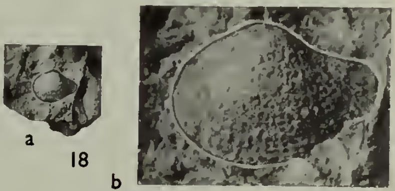
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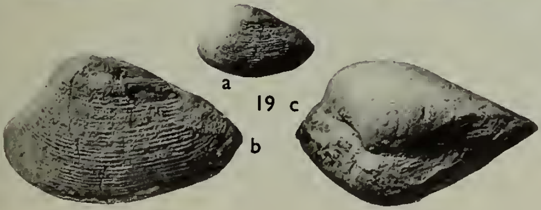
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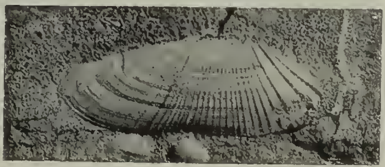
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PLATE 20

FIG. 1. *Pholadomya ovalis* (J. Sowerby). Callovian [?–Lower Oxfordian], Muddo Erri Limestones. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya. L.92075, × 1 . p. 126

FIG. 2. *Pholadomya reticulata* Agassiz. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. LL.35076, × 2 . . . . p. 125

FIGS. 3*a*, *b*. *Homomya rahmuensis* sp. nov. Oxfordian, Rahmu Shales. Uacha, 6 miles S. of Rahmu, N.E. Kenya. Holotype, L.92260 : *a*, right valve ; *b*, dorsal view, both × 1 . . . . p. 128

FIG. 4. *Homomya hortulana* Agassiz. Upper Kimmeridgian, *Nerinella* Bed. N. of Kipande, Tendaguru, Tanganyika. L.51177, × 1 . . . . p. 128

FIG. 5. *Pholadomya hemicardia* Roemer. Upper Oxfordian. Mandawa–Lonji creek traverse, Mandawa area, Tanganyika. LL.35156, × 1 . . . . . . p. 127

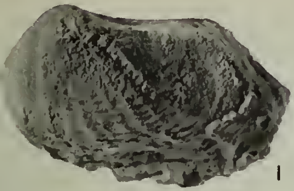
FIG. 6. *Pleuromya uniformis* (J. Sowerby). Upper Kimmeridgian. Kinjele, 5 miles W. of Mtapaia, Tanganyika. L.51934, × 1 . . . . p. 131

FIG. 7. *Ceratomya concentrica* (J. de C. Sowerby). Callovian [?–Lower Oxfordian], Muddo Erri Limestones. Kulong, 2 miles S.W. of Muddo Erri, N.E. Kenya. L.92084, × 1 . . . . p. 132

FIG. 8. *Pholadomya lirata* (J. Sowerby). Callovian. 2 miles E. of Magindu Station, Tanganyika. L.54120, × 1 . . . . p. 126

FIG. 9. *Pleuromya calceiformis* (Phillips). Upper Oxfordian. Mandawa–Lonji creek traverse, Mandawa area, Tanganyika. LL.35158, × 1 . . . . . . p. 132

FIG. 10. *Ceratomya excentrica* (Roemer). Kimmeridgian, Hereri Shales. Hereri river crossing 3, miles S. of Melka Kunha, N.E. Kenya : L.92200, × 1 . . . . p. 135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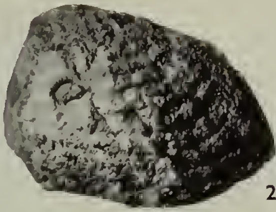
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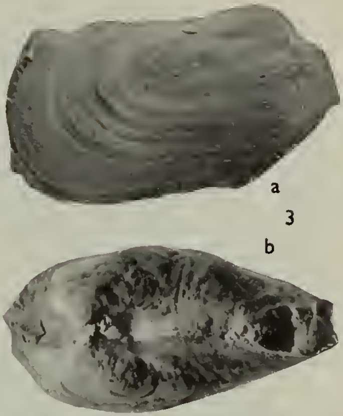

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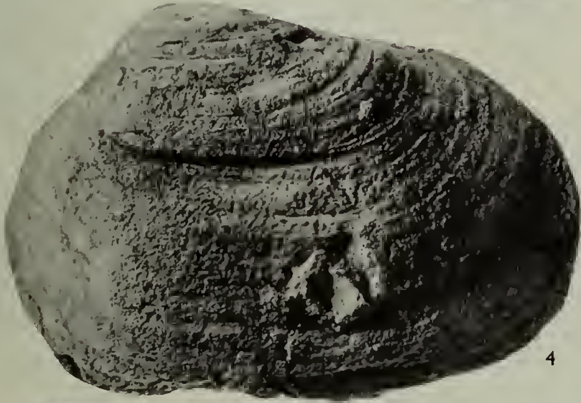
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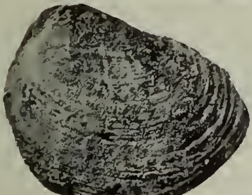
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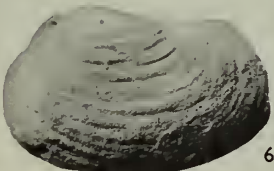
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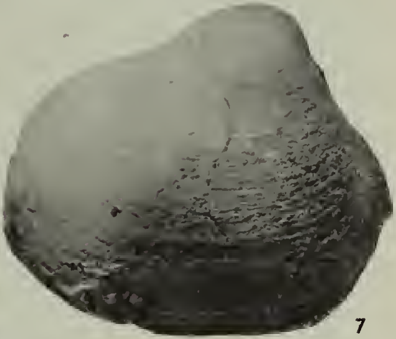
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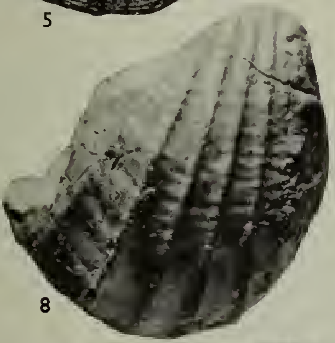
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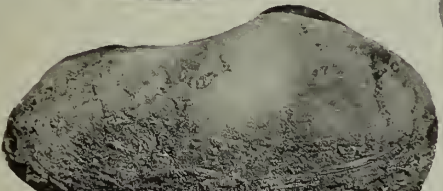
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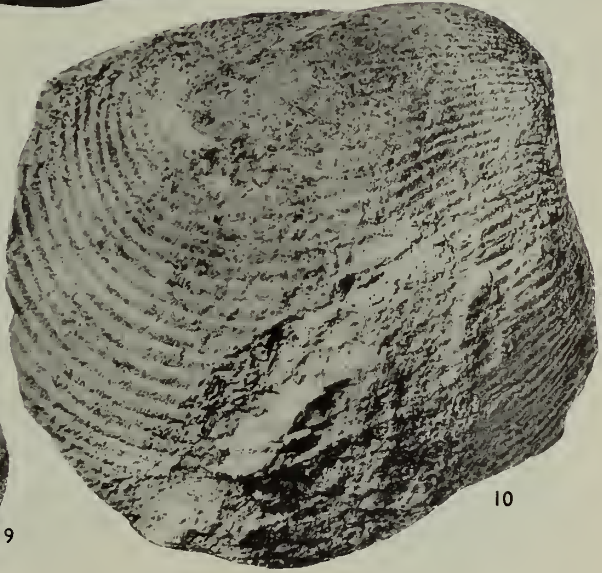
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PLATE 21

FIGS. 1*a*, *b*, *c*. *Ceratomya tanganyicensis* sp. nov. Bajocian (?), Pindiro Shales. Lihimaliao creek, Mandawa area, Tanganyika. Holotype, LL.35159 : *a*, right valve, × 1 ; *b*, dorsal view, × 1 ; *c*, ornament, × 4 . . . . p. 132

FIG. 2. *Goniomya trapezicostata* (Pusch). Callovian. ½ mile N.W. of bridge over Mkulumuzi river, 2 miles W. of Tanga, Tanganyika. LL.35157, × 1 . . . p. 129

FIG. 3. Same species. Bajocian. 1½ miles E. of Kidugallo Station, Tanganyika. L.54080, × 1 . . . . p. 129

FIG. 4. *Ceratomya pittieri* (de Loriol). Callovian. Magindu Station, Tanganyika. LL.35160, × 1 . . . . p. 133

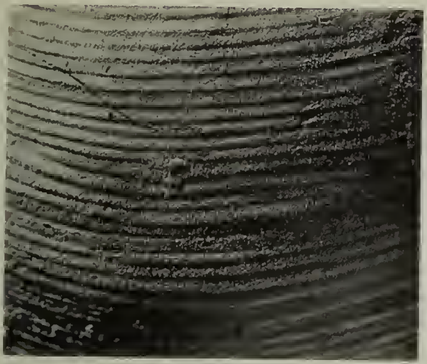
FIG. 5. *Ceratomya wilderriensis* sp. nov. Upper Oxfordian, Seir Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. Holotype, L.92226, × 1 . . . . . p. 134

FIGS. 6*a*, *b*. *Cuspidaria ayersi* sp. nov. Bathonian [? or Callovian], Asaharbito Beds. 1 mile N. of Asaharbito, N.E. Kenya. Holotype, LL.13246 : *a*, × 1 ; *b*, × 2 . p. 136

FIGS. 7*a*, *b*. Same species, horizon and locality. Paratype, LL.13247 : *a*, × 1 ; *b*, × 3 . . . . p. 136

FIG. 8. *Thracia lens* (Agassiz). Bajocian (?), Pindiro Shales. Lihimaliao creek, Mandawa area, Tanganyika. LL.35161, × 1 . . . . p. 135

FIG. 9. *Thracia viceliacensis* (d'Orbigny). Callovian. Lonji creek, Mandawa area, Tanganyika. LL.35162, × 1 . . . . p. 135



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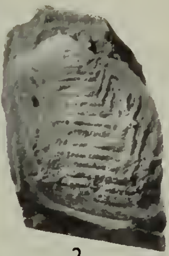

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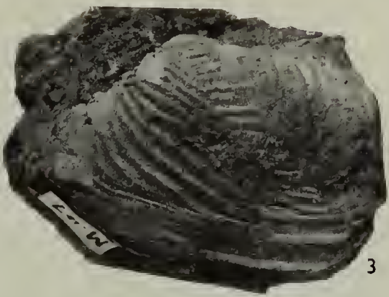

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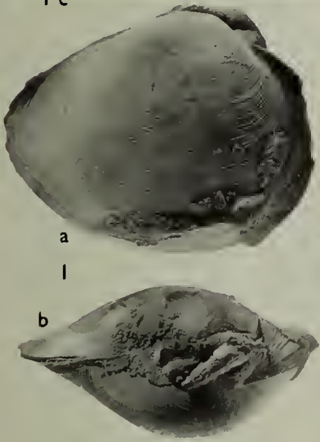

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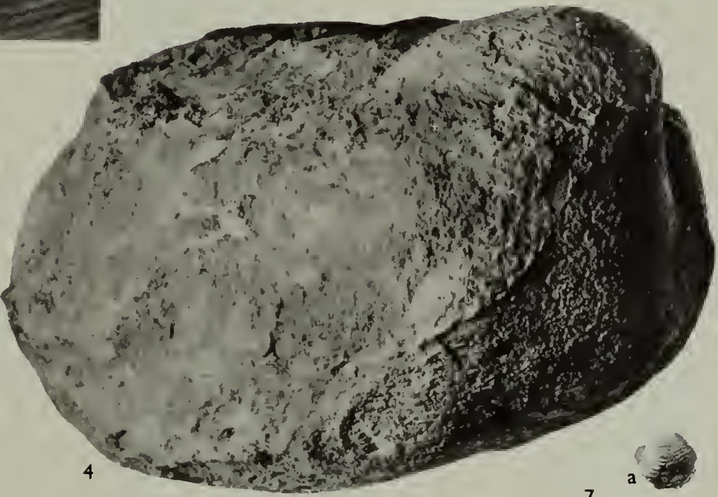

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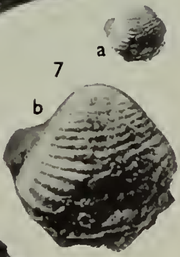

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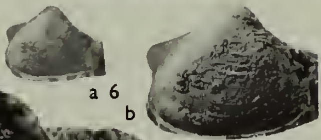

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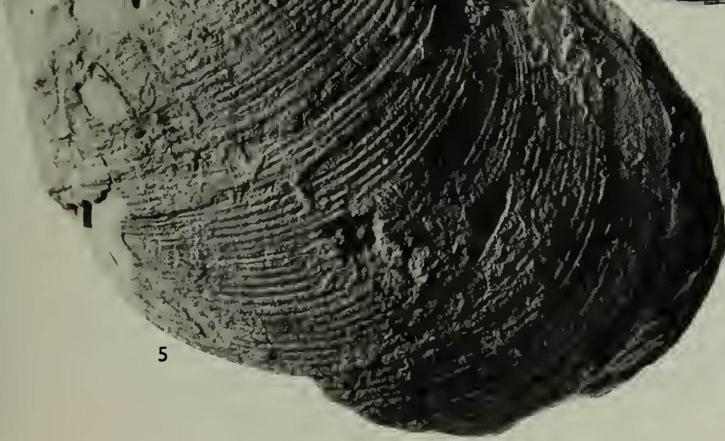

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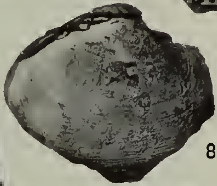

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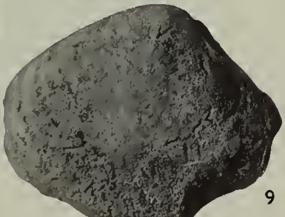

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PLATE 22

FIGS. 1*a*, *b*, *c*, *d*. *Discohelix didimtuensis* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, GG.10246 : *a*, × 1 ; *b*, upper face, × 4 ; *c*, lower face, × 4 ; *d*, outer face, × 4 . . . . p. 137

FIGS. 2*a*, *b*, *c*. *Nummocalcar mitoleensis* sp. nov. Upper Kimmeridgian. Mpilepile stream, E. of Mitole, Tanganyika. Holotype, GG.10282 : *a*, upper face ; *b*, lower face ; *c*, outer face, all × 1·5 . . . . p. 138

FIGS. 3*a*, *b*. *Pseudorhytidopilus lonjiensis* sp. nov. Callovian. Lonji–Runjo stream, 1½ miles W. of Mandawa, Tanganyika. Holotype, GG.10312 : *a*, side view ; *b*, apical view, both × 1 . . . . p. 139

FIGS. 4*a*, *b*. *Scurriopsis* (*Dietrichiella*) *kindopensis* (Dietrich). Upper Kimmeridgian, "*Trigonia smeei*" Bed. Kindope, N.N.W. of Tendaguru, Tanganyika. G.48913 : *a*, × 1 ; *b*, × 3 . . . . p. 141

FIGS. 5*a*, *b*. *Symmetrocapulus* ? sp. Upper Kimmeridgian, "*Trigonia smeei*" Bed. Tingutitinguti creek, Tendaguru, Tanganyika. G.48031 : *a*, × 1 ; *b*, × 3 . . p. 140

FIG. 6. *Bathrotomaria aitkeni* sp. nov. Middle–Upper Kimmeridgian. N. Bank of Mandawa–Namakongoro stream, about 1 mile W. of Mandawa, Tanganyika. Holotype, GG.10306 : abapertural view, × 1 . . . . p. 138

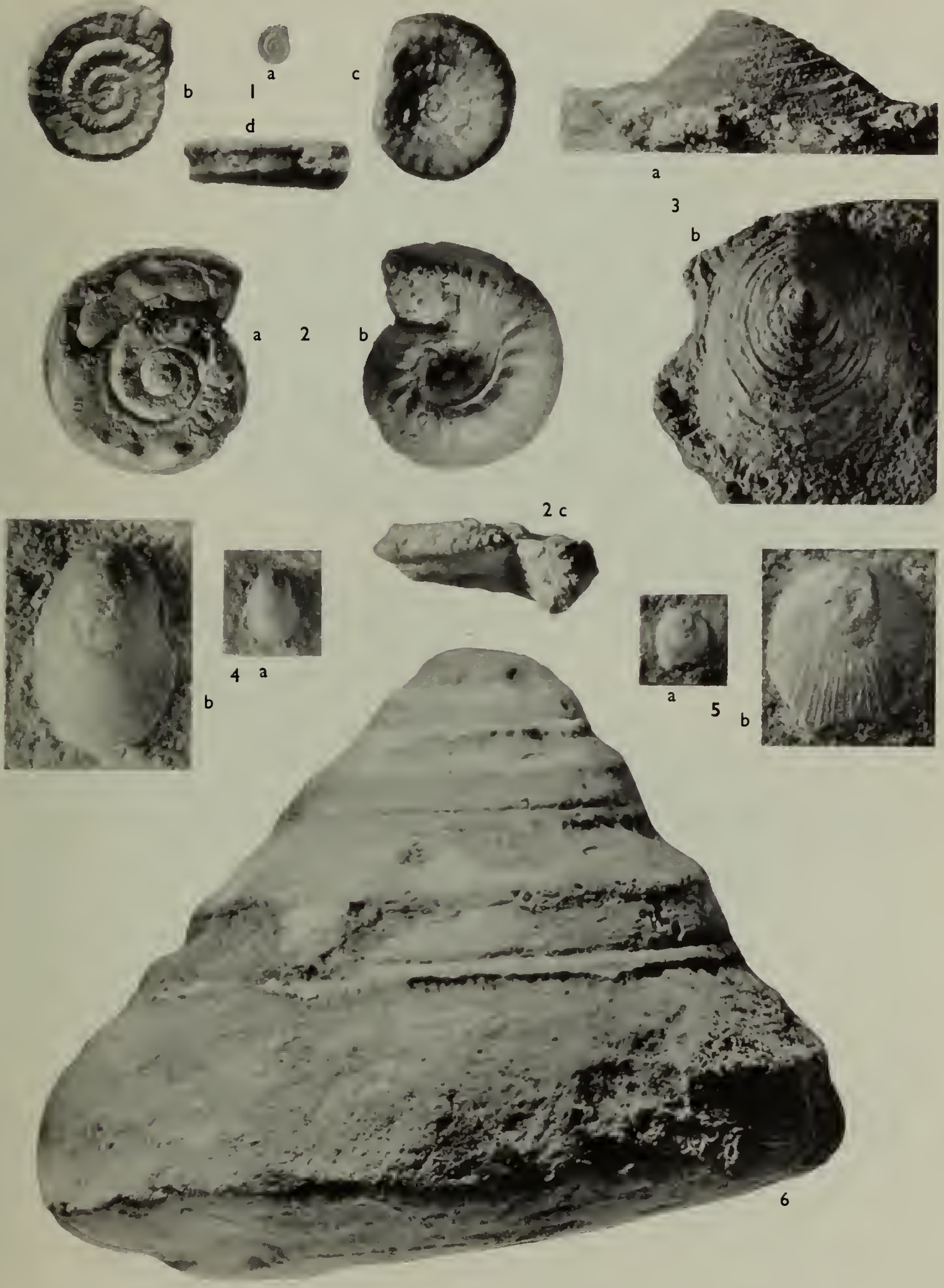

b
a
1
c
d
a
3
b
a
2
b
2 c
4 a
b
a
5
b
6

PLATE 23

Figs. 1*a*, *b*. *Bathrotomaria aitkeni* sp. nov. Middle–Upper Kimmeridgian. N. bank of Mandawa–Namakongoro stream, about 1 mile W. of Mandawa, Tanganyika. Holotype, GG.10306 : *a*, apertural view ; *b*, base, both × 1 . . . . . . p. 138

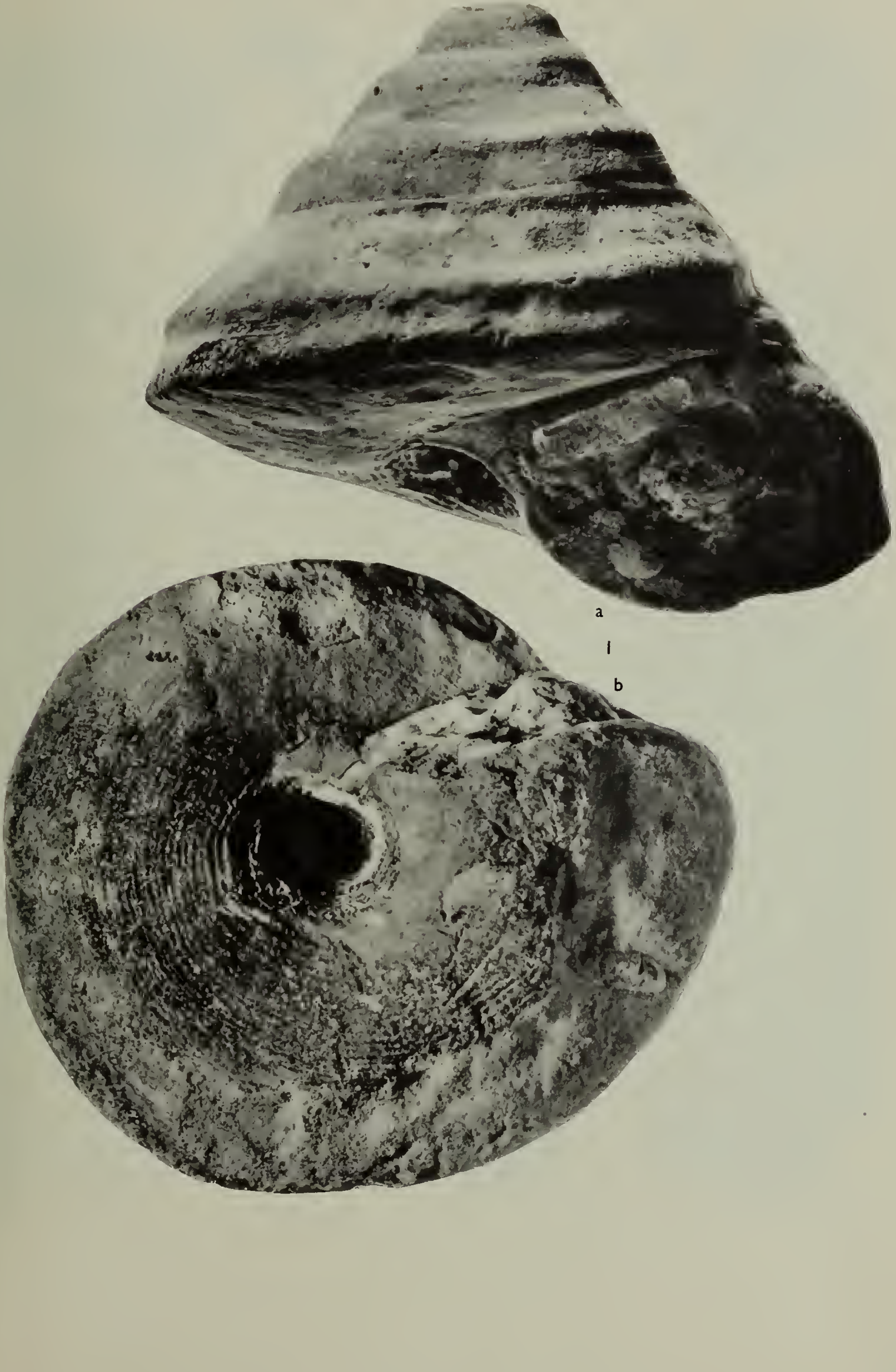

a
1
b

PLATE 24

FIGS. 1*a*, *b*, *c*. *Chrysostoma staffi* Dietrich. Upper Kimmeridgian. Tapaira trail, S. of Tendaguru, Tanganyika. G.48567 : *a*, × 1 ; *b*, apertural view, × 2 ; *c*, abapertural view, × 2 . . . . p. 142

FIGS. 2*a*, *b*. *Ataphrus* aff. *acmon* (d'Orbigny). Bajocian. Kidugallo, Tanganyika. G.26204 : *a*, × 1 ; *b*, × 3 . . . . p. 143

FIGS. 3*a*, *b*. *Chartronella mitoleensis* sp. nov. Upper Kimmeridgian. Mpilepile stream, about 1 mile N.E. of Mitole, Tanganyika. Holotype, GG.10313 : *a*, apertural view ; *b*, abapertural view, both × 1 . . . . p. 145

FIGS. 4*a*, *b*. *Lissochilus stremmei* Dietrich. Upper Kimmeridgian. 1½ miles N.W. of Mandawa, Tanganyika. GG.10315 : *a*, apertural view ; *b*, abapertural view, both × 1 p. 145

FIGS. 5*a*, *b*, *c*, *d*. *Trochopsidea africana* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, GG.10258 : *a*, × 1 ; *b*, apertural view, × 3 ; *c*, abapertural view, × 3 ; *d*, base, × 3 . . . . p. 143

FIGS. 6*a*, *b*. *Pseudomelania* (*Oonia*) *dietrichi* sp. nov. Upper Kimmeridgian. "*Trigonia smeei*" Bed. Tingutitinguti creek, Tendaguru, Tanganyika. Holotype, G.48028 : *a*, apertural view ; *b*, abapertural view, both × 1 . . . . p. 150

FIGS. 7*a*, *b*. *Neritoma* (*Neridomus*) aff. *gea* (d'Orbigny). S. of Tarawanda, 11 miles S.E. of Lugoba, Tanganyika. G.61310 : *a*, × 1 ; *b*, × 2 . . . . . . p. 144

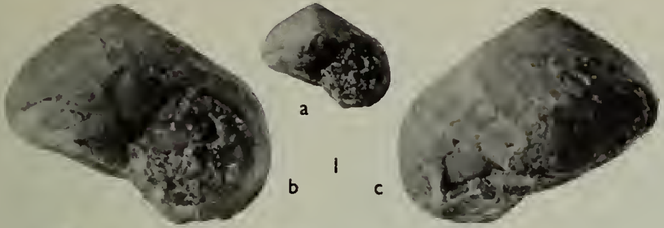
FIGS. 8*a*, *b*. *Cirrus mazarasensis* sp. nov. Bajocian (?), Mazeras Sandstones. Ribe, 9 miles N.E. of Mazeras, Kenya. Holotype, GG.6524, "squeeze" from natural mould : *a*, × 1 ; *b*, × 2·5 . . . . p. 146

FIGS. 9*a*, *b*. *Hamusina thompsoni* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, GG.10263 : *a*, × 1 ; *b*, × 3 . p. 146

FIG. 10. *Pseudomelania aspasia* (d'Orbigny). Callovian. Nchia stream, 2 miles W.N.W. of Mandawa, Tanganyika. GG.10317, × 1 . . . . p. 147

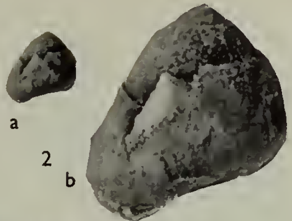
FIGS. 11*a*, *b*, *c*. *Pseudomelania dusseensis* sp. nov. Upper Oxfordian, Seir Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. Holotype, G.76399 ; *a*, × 1 ; *b*, apertural view, × 3·7 ; *c*, abapertural view, × 3·7 . . . . p. 148

FIG. 12. *Pseudomelania vittata* (Phillips). Middle–Upper Kimmeridgian. 1 mile N. of Manyuli, Tanganyika. GG.10316, × 1 . . . . p. 148



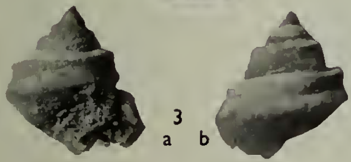
a

b 1 c



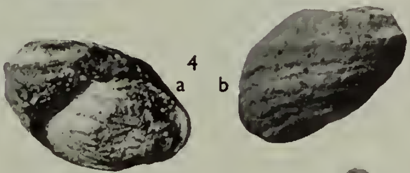
a

2 b



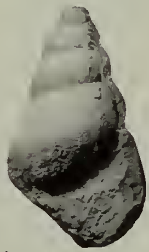
3

a b

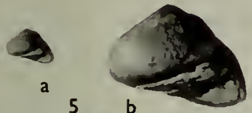


4

a b

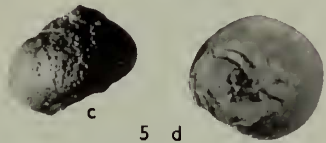


6 a



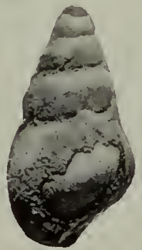
a

5 b



c

5 d



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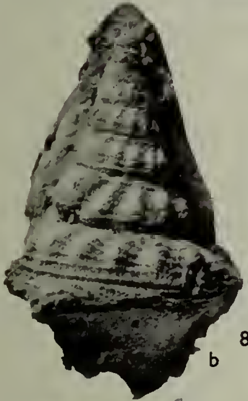
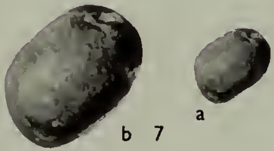
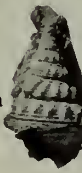


b

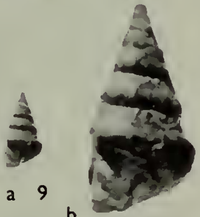


a

b 7

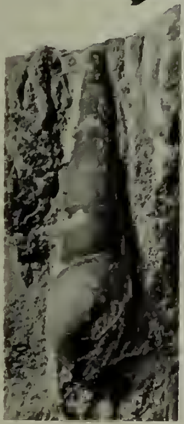


8 a



a 9

b



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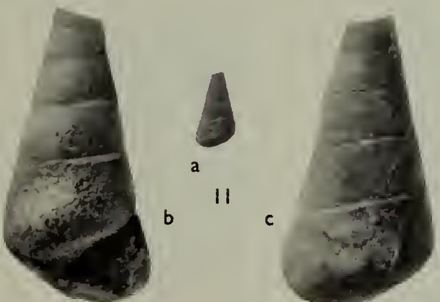
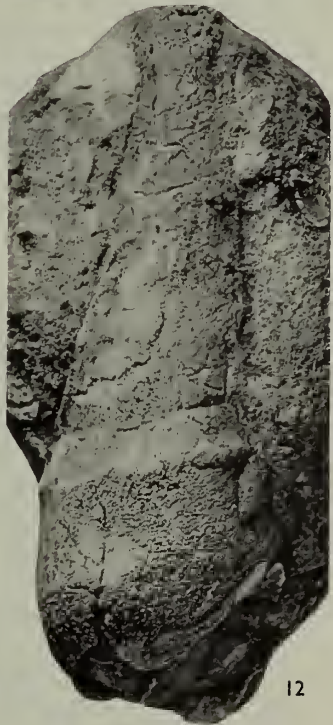


a

11

b c



12

PLATE 25

FIGS. 1*a*, *b*, *c*. *Pseudomelania* (*Oonia*) *aitkeni* sp. nov. Middle–Upper Kimmeridgian. Mandawa–Namakongoro stream, 1 mile W. of Mandawa, Tanganyika. Holotype, GG.10318 : *a*, × 1 ; *b*, apertural view, × 2 ; *c*, abapertural view, × 2 . . p. 151

FIGS. 2*a*, *b*, *c*. *Pseudomelania* (*Oonia*) *conica* (Morris & Lycett). Bathonian (?). 2 miles W. of Tengeni, Tanganyika. GG.10463 : *a*, × 1 ; *b*, apertural view, × 2 ; *c*, abapertural view, × 2 . . . . p. 150

FIGS. 3*a*, *b*. *Zygopleura mandawaensis* sp. nov. Bajocian (?). Depth 58–60 feet, Mandawa well no. 6, Tanganyika. Paratype, GG.10287 : *a*, × 1 ; *b*, × 4 . . p. 154

FIGS. 4*a*, *b*. *Coelostylina mandawaensis* sp. nov. Bajocian (?), Pindiro Shales. Lihimaliao creek, Mandawa area, Tanganyika. Paratype, GG.10286, showing aperture : *a*, × 1 ; *b*, × 3 . . . . p. 153

FIGS. 5*a*, *b*. Same species and formation. Near site of Mandawa well no. 1, Tanganyika. Holotype, GG.10283 : *a*, × 1 ; *b*, × 3 . . . . p. 153

FIGS. 6*a*, *b*. Same species, formation and locality. Paratype, GG.10285 : *a*, × 1 ; *b*, × 3 . . . . p. 153

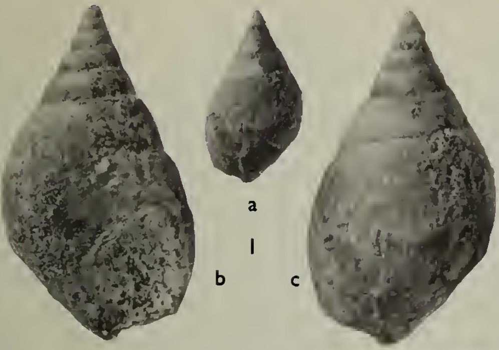
FIGS. 7*a*, *b*. Same species, formation and locality. Paratype, GG.10284 : *a*, × 1 ; *b*, × 3 . . . . p. 153

FIG. 8. *Bourguetia saemanni* (Oppel). Upper Oxfordian, Seir Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. G.76404, × 1 . . . . p. 152

FIG. 9. Same species. Upper Oxfordian. E. margin of Makoko plain, Bagamoyo hinterland, Tanganyika. GG.2182, × 1 . . . . p. 152

FIG. 10. *Pseudomelania* (*Rhabdoconcha*) *wilderriensis* sp. nov. Upper Oxfordian, Seir Limestones. Wilderri hill, 11 miles S.S.W. of Rahmu, N.E. Kenya. Holotype, G.76414, × 1 . . . . p. 151

FIG. 11. *Zygopleura mandawaensis* sp. nov. Bajocian (?), Pindiro Shales. Lihimaliao creek, Mandawa area, Tanganyika. Holotype, GG.10465, × 3 . . . . p. 154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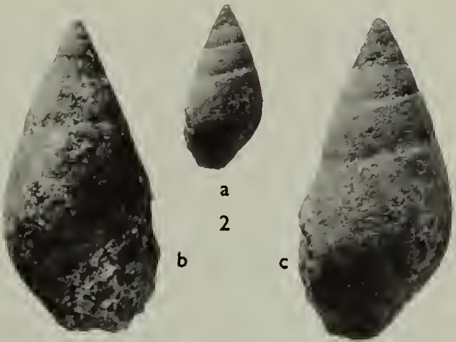
1
b
c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2
b
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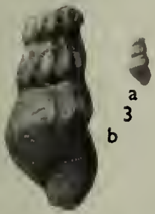
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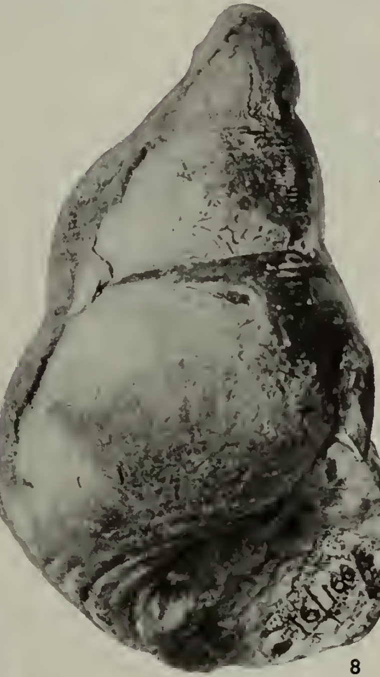
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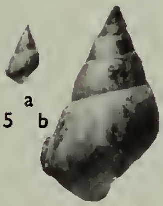
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a
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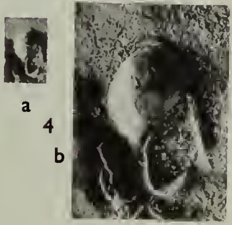
a
4
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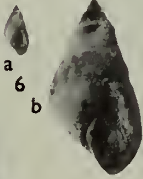
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6
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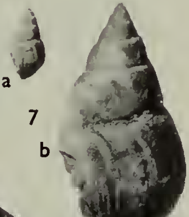
a
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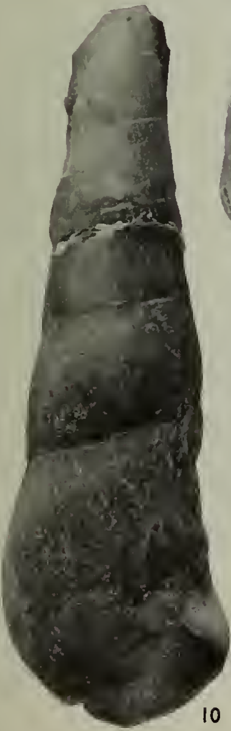
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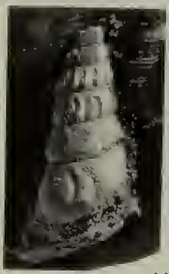
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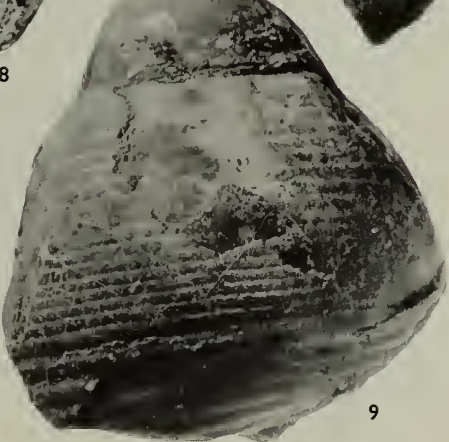
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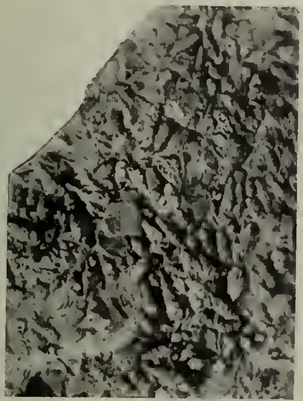
PLATE 26

FIGS. 1*a*, *b*. *Exelissa dodsoni* sp. nov. Bathonian–Callovian, Bur Mayo Limestones. Hagardulun, 25 miles N.E. of Tarbaj, N.E. Kenya. *a*, group of specimens, G.79190, showing holotype and numerous paratypes, × 1 ; *b*, part of same group, with holotype near middle of left side of figure, × 4 . . . . p. 158

FIG. 2. *Purpuroidea* aff. *gigas* (Thurmann & Étallon). Upper Kimmeridgian. ¾ mile N.W. of Mbinga, Tanganyika. GG.10328, × 0·8 . . . . p. 155

FIGS. 3*a*, *b*, *c*. *Coelostylina stockleyi* sp. nov. Bajocian. 2½ miles N.N.W. of Kidugallo, Tanganyika. Holotype, GG.10281 : *a*, × 1 ; *b*, apertural view, × 3 ; *c*, abapertural view, × 3 . . . . p. 152

FIGS. 4*a*, *b*, *c*. *Pseudomelania* (*Oonia*) *kidugalloensis* sp. nov. Bajocian. 2½ miles N.N.W. of Kidugallo, Tanganyika. Holotype, GG.10280 ; *a*, × 1 ; *b*, apertural view, × 3 ; *c*, abapertural view, × 3 . . . . p. 149



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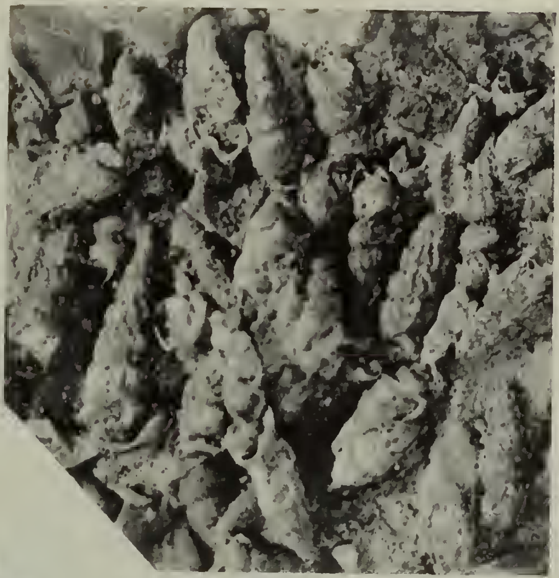

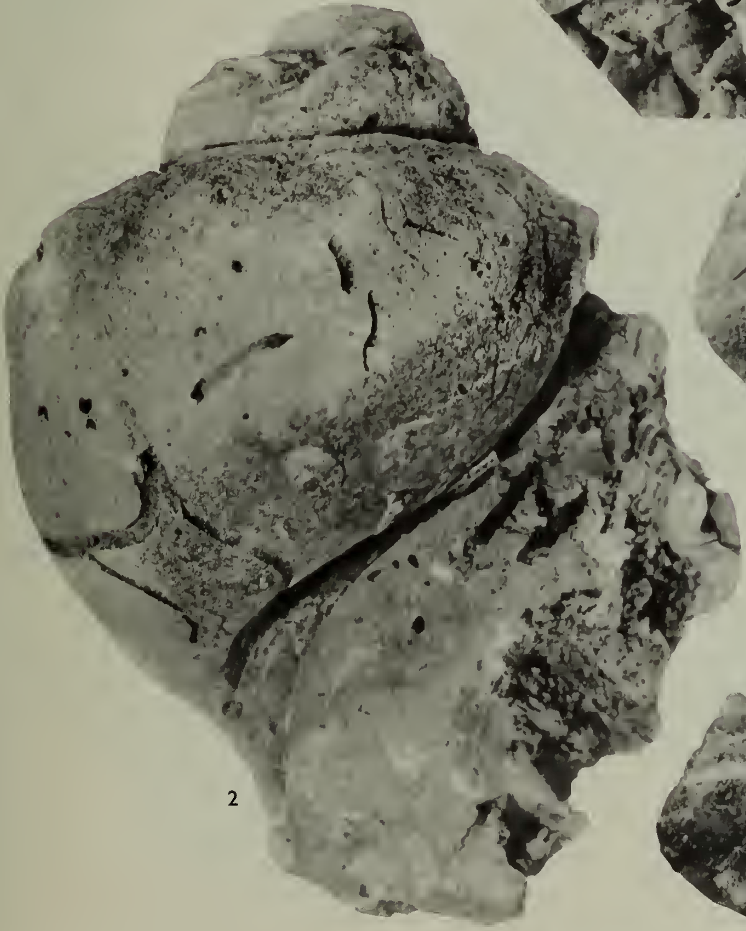

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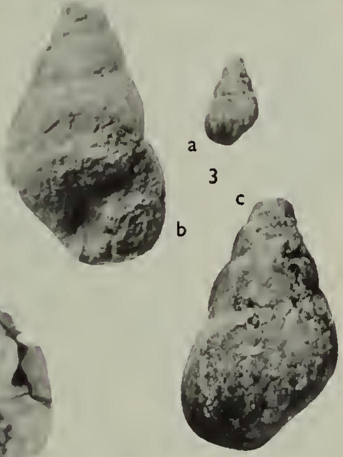


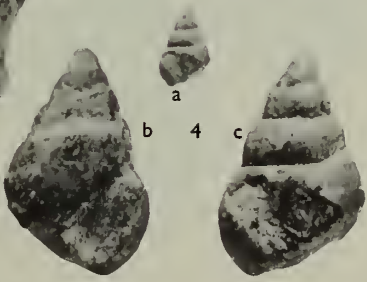


PLATE 27

FIGS. 1*a*, *b*. *Cryptaulax bussagensis* (Cossmann). Bathonian (?). 2 miles W. of Tengeni, Tanganyika. GG.10464 : *a*, × 1 ; *b*, × 3 . . . . p. 160

FIGS. 2*a*, *b*. *Exelissa africana* sp. nov. Bajocian (?). Depth 58–60 feet, Mandawa well no. 6, Tanganyika. Paratype, GG.10296 : *a*, × 1 ; *b*, × 4 . . . . . p. 157

FIGS. 3*a*, *b*. Same species. Bajocian (?). Depth 52–54 feet, Mandawa well no. 6, Tanganyika. Paratype, GG.10294 : *a*, × 1 ; *b*, × 4 . . . . . . p. 157

FIGS. 4*a*, *b*. Same species. Bajocian (?). Depth 58–60 feet, Mandawa well no. 6, Tanganyika. Paratype, GG.10297 : *a*, × 1 ; *b*, × 4 . . . . . . p. 157

FIGS. 5*a*, *b*. Same species. Bajocian (?). Depth 58–60 feet, Mandawa well no. 6, Tanganyika. Holotype, GG.10295 : *a*, × 1 ; *b*, × 4 . . . . . . p. 157

FIGS. 6*a*, *b*. *Paracerithium lonjiense* sp. nov. Lower Kimmeridgian. Mandawa–Lonji creek traverse, Tanganyika. Paratype, GG.10299 : *a*, × 1 ; *b*, × 8 . . . p. 159

FIGS. 7*a*, *b*. *Pietteia stockleyi* sp. nov. Bajocian (?). Depth 58–60 feet, Mandawa well no. 6, Tanganyika. Paratype, GG.10300 : *a*, × 1 ; *b*, × 4 . . . . . p. 160

FIGS. 8*a*, *b*. Same species. Bajocian (?). Depth 60–62 feet, Mandawa well no. 6, Tanganyika. Paratype, GG.10301 : *a*, × 1 ; *b*, × 4 . . . . . . p. 160

FIGS. 9*a*, *b*. *Procerithium* (*Rhabdocolpus*) *mandawaense* sp. nov. Bajocian (?). Depth 62–64 feet, Mandawa well no. 6, Tanganyika. Paratype, GG.10291 : *a*, × 1 ; *b*, × 4 p. 156

FIGS. 10*a*, *b*. Same species. Bajocian (?). Depth 46–48 feet, Mandawa well no. 6, Tanganyika. Paratype, GG.10292 : *a*, × 1 ; *b*, × 4 . . . . . . p. 156

FIGS. 11*a*, *b*. Same species. Bajocian (?). Depth 48–50 feet, Mandawa well no. 6, Tanganyika. Paratype, GG.10293 : *a*, × 1 ; *b*, × 4 . . . . . . p. 156

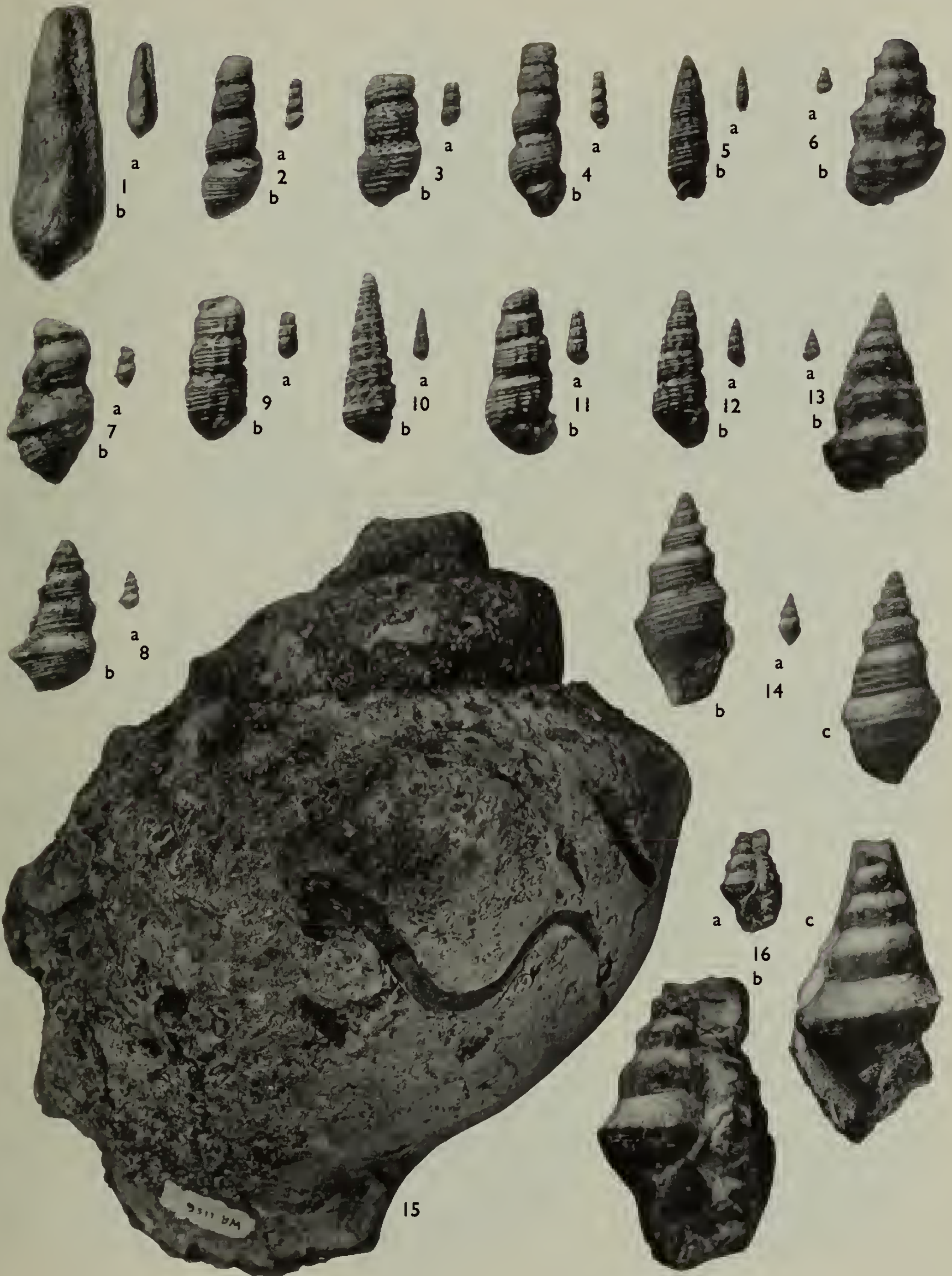
FIGS. 12*a*, *b*. Same species. Bajocian (?). Depth 46–48 feet, Mandawa well no. 6, Tanganyika. Holotype, GG.10290 : *a*, × 1 ; *b*, × 4 . . . . . . p. 156

FIGS. 13*a*, *b*. *Paracerithium lonjiense* sp. nov. Lower Kimmeridgian. Mandawa–Lonji creek traverse, Tanganyika. Holotype, GG.10298 : *a*, × 1 ; *b*, × 8 . . . p. 159

FIGS. 14*a*, *b*, *c*. *Pietteia stockleyi* sp. nov. Bajocian (?). Near site of Mandawa well no. 1, Tanganyika. Holotype, GG.10359 : *a*, × 1 ; *b*, apertural view, × 4 ; *c*, abapertural view, × 4 . . . . p. 160

FIG. 15. *Purpuroidea* aff. *gigas* (Thurmann & Étallon). Upper Kimmeridgian. ¾ mile N.W. of Mbinga, Tanganyika. GG.10328, × 0·8 . . . . p. 155

FIGS. 16*a*, *b*, *c*. *Pietteia dusseensis* sp. nov. Upper Oxfordian, Seir Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. Holotype, G.76405 : *a*, × 1 ; *b*, apertural view, × 3 ; *c*, abapertural view, × 3 . . . . p. 162


1 a
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12 b
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13 b
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8 b
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14 c
16 a
16 b
16 c
15

PLATE 28

FIG. 1. *Harpagodes thirriae* (Contejean). Upper Kimmeridgian, Dakacha Limestones. 10½ miles S.W. of Raiya hills, N.E. Kenya. Internal mould, G.70520, × 1 . . . p. 163

FIG. 2. Same species, horizon and locality. Internal mould, G.70519, × 1 . . . p. 163

FIG. 3. *Harpagodes* aff. *oceani* (Brongniart). Callovian. Manyuli stream, just W. of Nautope, Tanganyika. GG.10319, × 1 . . . . p. 162

FIGS. 4*a*, *b*. *Purpuroidea supraliasica* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, GG.10264 : *a*, apertural view (aperture broken) ; *b*, abapertural view, both × 1 . . . . p. 155

FIGS. 5*a*, *b*, *c*. *Globularia hennigi* sp. nov. Upper Kimmeridgian, Dakacha Limestones. 2 miles S. of Melka Dakacha, N.E. Kenya. Holotype, G.76391 : *a*, abapertural view, × 1 ; *b*, abapertural view, × 2 ; *c*, apertural view, × 1 . . . . . . p. 167

FIGS. 6*a*, *b*, *c*. *Pictavia tanganyicensis* sp. nov. Bajocian (?). Near site of Mandawa well no. 1, Tanganyika. Holotype, GG.10302 : *a*, × 1 ; *b*, apertural view, × 5 ; *c*, abapertural view, × 5 . . . . p. 167

FIGS. 7*a*, *b*. Same species, horizon and locality. Paratype, GG.10303 : *a*, × 1 ; *b*, × 5 . . . . p. 167

FIG. 8. *Ampullospira dejanira* (d'Orbigny). Upper Oxfordian, Seir Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. G.76395, × 1 . . . . . . p. 165

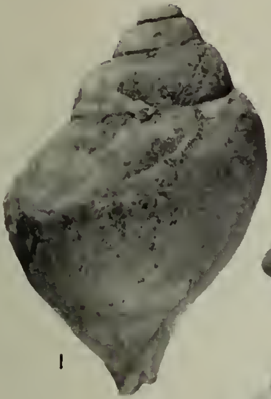
FIG. 9. *Globularia hemisphaerica* (Roemer). Upper Kimmeridgian, Dakacha Limestones. N. of Figfirya, northern Raiya hills, N.E. Kenya. G.76384, × 1 . . . p. 166

FIG. 10. *Ampullospira besairiei* sp. nov. Bajocian. S.W. of geodetic point Antery, Maevatanana district, N.W. Madagascar. Paratype, G.65892, × 1 . . . . p. 164

FIGS. 11*a*, *b*. Same species. Bajocian (?), Pindiro Shales. Near site of Mandawa well no. 1, Tanganyika. Paratype, GG.10305 : *a*, apertural view (outer lip broken) ; *b*, abapertural view, both × 1 . . . . p. 164

FIGS. 12*a*, *b*. Same species and horizon. Lihimaliao creek, Mandawa area, Tanganyika. Holotype, GG.10304, spire crushed in slightly : *a*, abapertural view ; *b*, apertural view, both × 1 . . . . p. 164

FIG. 13. Same species. Bajocian. S.W. of geodetic point Antery, Maevatanana district, N.W. Madagascar. Paratype, G.65887, × 1 . . . . p. 164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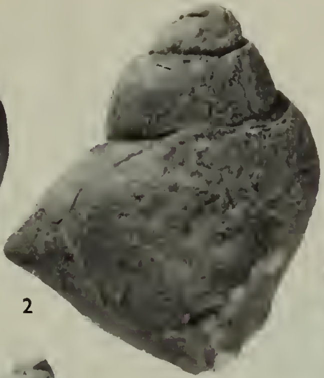
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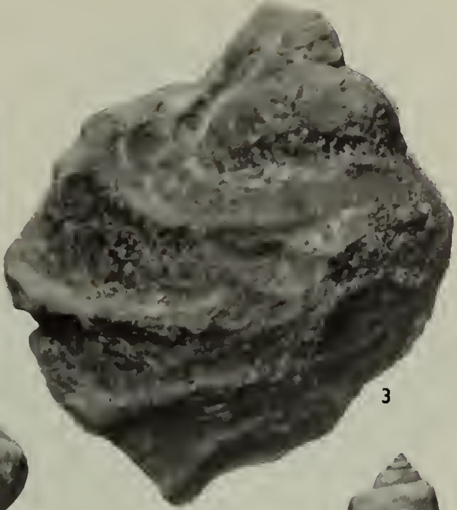
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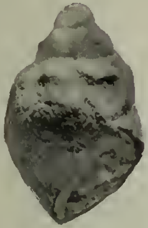
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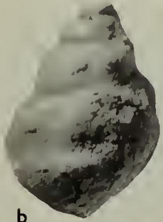
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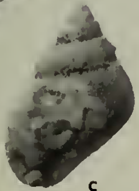
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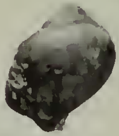
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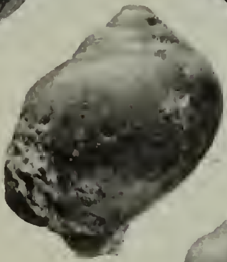
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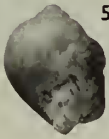
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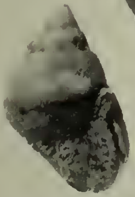
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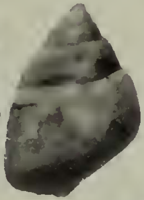
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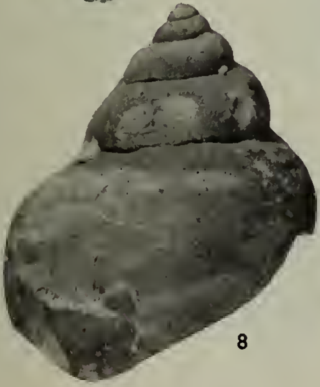
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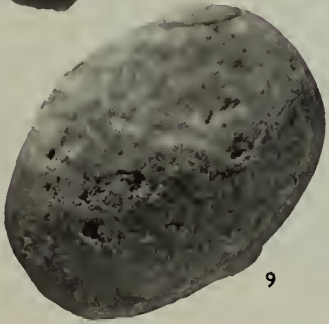
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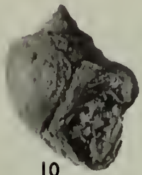
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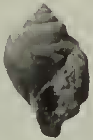
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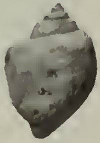
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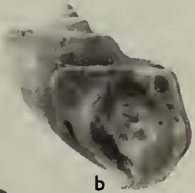
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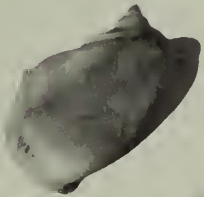
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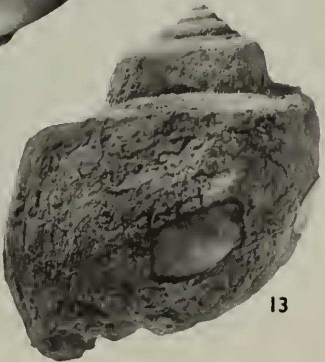
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PLATE 29

FIGS. 1*a*, *b*. *Globularia phasianelloides* (d'Orbigny). Upper Oxfordian, Seir Limestones. Dussé, 1½ miles S.E. of Rahmu, N.E. Kenya. G.76397 : *a*, apertural view ; *b*, abapertural view, both × 1 . . . . p. 166

FIGS. 2*a*, *b*, *c*. *Ampullospira quennelli* sp. nov. Callovian. Nchia stream, 2 miles W.N.W. of Mandawa, Tanganyika. Paratype, GG.10325 : *a*, apertural view ; *b*, abapertural view ; *c*, apical view, showing sutural channel, all × 1 . . . . . p. 165

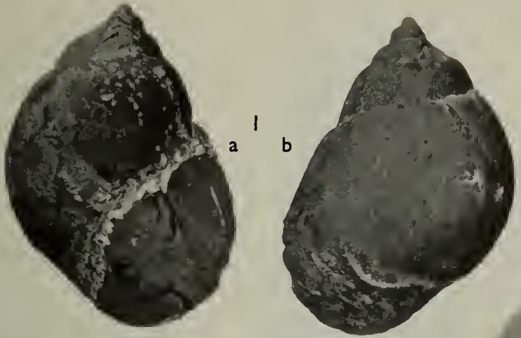
FIGS. 3*a*, *b*, *c*. Same species. Kimmeridgian. Just W. of Mabokweni, 4 miles N.W. of Tanga, Tanganyika. Holotype, G.91998 : *a*, apertural view ; *b*, abapertural view ; *c*, apical view, all × 1 . . . . p. 165

FIGS. 4*a*, *b*, *c*. *Acteonina* (*Striactaeonina*) *supraliasica* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, GG.10271 : *a*, × 1 ; *b*, apertural view, × 2 ; *c*, abapertural view, × 2 . . . . p. 173

FIGS. 5*a*, *b*. *Akera tanganyicensis* sp. nov. Callovian. 1 mile N.W. of Mbinga, Tanganyika. Holotype, GG.10332 : *a*, apertural view ; *b*, abapertural view, both × 1 p. 174

FIGS. 6*a*, *b*. *Promathildia* aff. *opalini* (Quenstedt). Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. GG.10270 : *a*, × 1 ; *b*, × 2 . . p. 168

FIG. 7. *Trochalia depressa* (Voltz). Upper Kimmeridgian, Dakacha Limestones. Melka Dakacha, N.E. Kenya. G.76375 : axial section (partly retouched), × 1 . p. 172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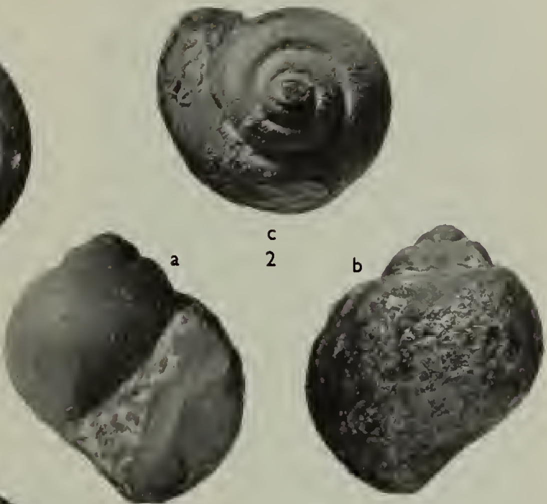
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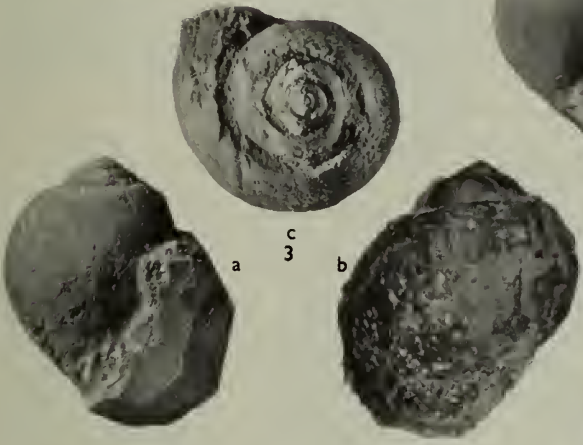
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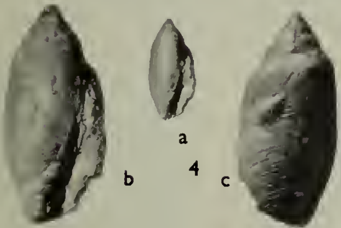
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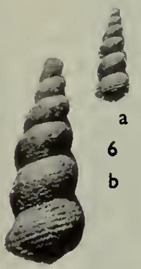
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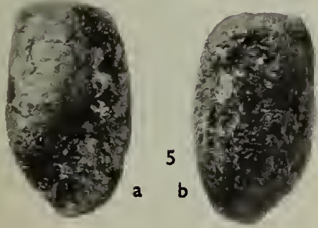
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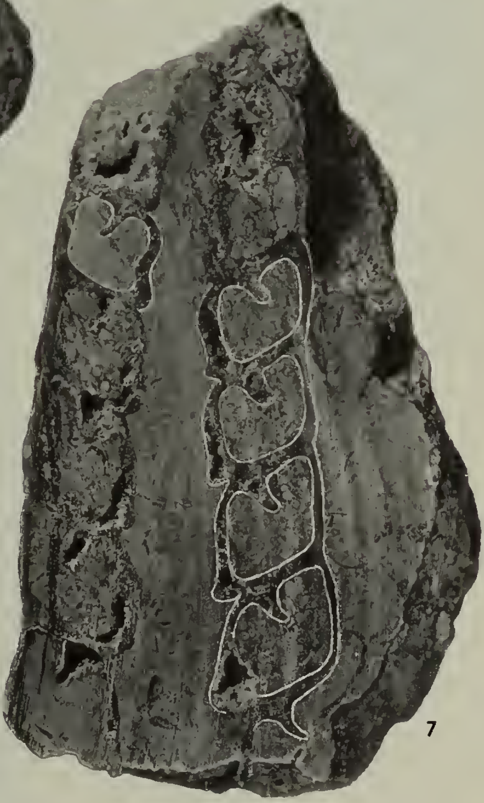
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PLATE 30

Fig. 1. *Nerinella mandawaensis* sp. nov. Middle–Upper Kimmeridgian. Mandawa–Namakongoro stream, about 1 mile W. of Mandawa, Tanganyika. Paratype, GG.10334, × 1·1 . . . . p. 171

Figs. 2*a*, *b*. Same species, horizon and locality. Holotype, GG.10333 : *a*, × 1 ; *b*, × 2 . . . . p. 171

Fig. 3. Same species, horizon and locality. Paratypes, GG.10335, one seen in axial section (partly retouched), × 2 . . . . p. 171

Figs. 4*a*, *b*. *Nerinella cutleri* sp. nov. Upper Kimmeridgian, *Nerinella* Bed. Kipande path, near Tendaguru, Tanganyika. Holotype, G.46026 : *a*, × 1 ; *b*, × 2 . p. 170

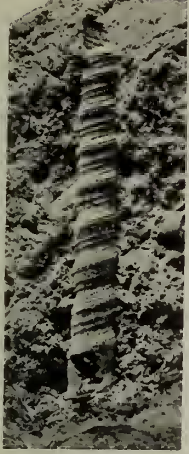
Fig. 5. *Pseudonerinea clio* (d'Orbigny). Upper Kimmeridgian. ½ mile E. of Nangororo, Tanganyika. GG.10329, × 1 . . . . p. 172

Fig. 6. Same species, horizon and locality. GG.10330, axial section (partly retouched), × 1 . . . . p. 172

Fig. 7. *Cossmannea hennigi* (Dietrich). Upper Kimmeridgian, " *Trigonia smeei* " Bed. Tributary of Maimbwi river, near Tendaguru, Tanganyika. G.48914, × 1 . . p. 169

Figs. 8*a*, *b*. *Pietteia mandawaensis* sp. nov. Bajocian (?), Pindiro Shales. Near site of Mandawa well no. 1, Tanganyika. Holotype, GG.10382 : *a*, × 1 ; *b*, × 4 . p. 161

Figs. 9*a*, *b*, *c*. *Africoconulus kenyanus* sp. nov. Upper Lias, Toarcian. Didimtu hill, 2 miles S. of Bur Mayo, N.E. Kenya. Holotype, GG.10250 : *a*, apertural view ; *b*, abapertural view ; *c*, base, all × 2 . . . . p. 142



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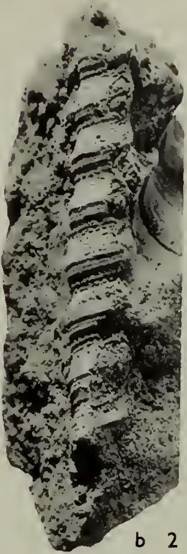

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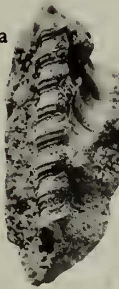

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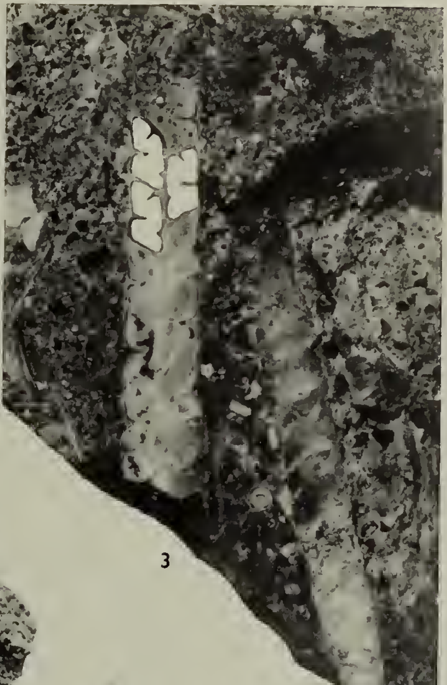

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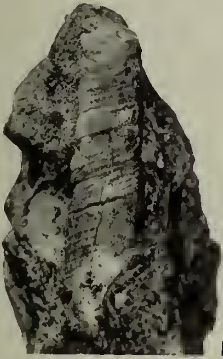

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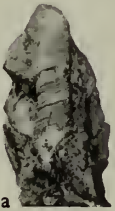

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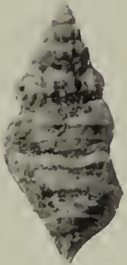

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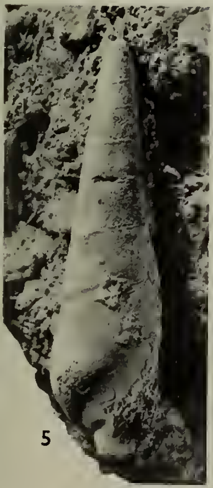

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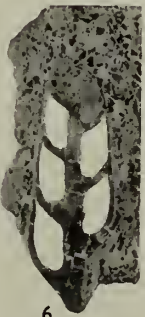

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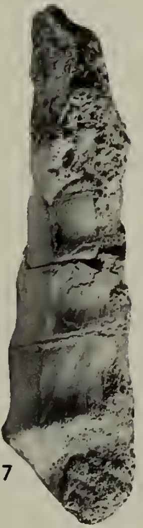

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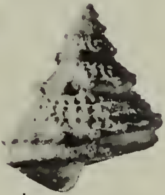

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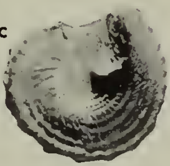

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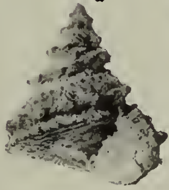

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